DEPARTMENT OF TRANSPORT

PEDESTRIAN SAFETY AT PUBLIC ROAD LEVEL CROSSINGS

Report of a Committee Chaired by
Rt Hon Sally Oppenheim MP

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COMMITTEE OF INQUIRY INTO PEDESTRIAN SAFETY AT LEVEL CROSSINGS
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20 April 1983

The Rt. Hon. David Howell M.P.
Secretary of State for Transport
2 Marsham Street
London SW1

Dear Secretary of State

You appointed us on 22 November 1982 with terms of reference:

> "To review pedestrian safety at public road level crossings, and the report of the Department of Transport/British Railways Board working party on level crossing protection, published in July 1978, so far as it concerns protection of pedestrians, and to recommend whether additional measures are justified for protecting pedestrians, what they should be, and in what circumstances they should be adopted".

We now submit our report.

We hope this will provide a firm and durable basis for reconciling the interests of pedestrians using level crossings with the BR Board's modernisation programme.

We should like to acknowledge the valuable assistance received from the Department of Transport and from the BR Board throughout the course of our work. We should also like to acknowledge the help we received from parents, teachers, railwaymen, elected representatives and others who attended our public meetings and to thank the many people who have written to us with evidence and expressing views. Finally, we want to recognise the able and unstinting work of our Secretary, Roger Jones, who did so much to make our task easier.

Sally Oppenheim

Juliet Baxter

Terence Bendixson

A Silverleaf

EXTRACT FROM A LETTER WRITTEN BY CHARLES DICKENS IN MARCH 1842 TO A FRIEND, JOHN FOSTER, WHEN DICKENS WAS IN PHILADELPHIA

PHILADELPHIA AND THE SOUTH

"I wish you could see what an American railroad is, in some parts where I now have seen them. I won't say I wish you could feel what it is, because that would be an unchristian and savage aspiration. It is never inclosed, or warded off. You walk down the main street of a large town: and, slap-dash, headlong, pell-mell, down the middle of the street; with pigs burrowing, and boys flying kites and playing marbles, and men smoking, and women talking, and children crawling, close to the very rails; there comes tearing along a mad locomotive with its train of cars, scattering a red-hot shower of sparks (from its *wood* fire) in all directions; screeching, hissing, yelling, and panting; and nobody one atom more concerned than if it were a hundred miles away. You cross a turnpike-road; and there is no gate, no policeman, no signal—nothing to keep the wayfarer or quiet traveller out of the way, but a wooden arch on which is written in great letters 'Look out for the locomotive'. And if any man, woman, or child, don't look out, why it's his or her fault, and there's an end of it."

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CHAPTER 1

THE BACKGROUND

Introduction

1.1 We were appointed on 22 November 1982 with the following terms of reference:—

> "To review pedestrian safety at public road level crossings, and the report of the Department of Transport/British Railways Board working party on level crossing protection, published in July 1978, so far as it concerns protection of pedestrians, and to recommend whether additional measures are justified for protecting pedestrians, what they should be, and in what circumstances they should be adopted."

1.2 We now submit our report.

1.3 From Victorian times until the 1950s, road users of level crossings felt protected from trains by sturdy reassuring gates which sealed off the railway track from the road. Pedestrians were often provided with side-gates or "wickets". Sometimes these were lockable by crossing keepers or signalmen. The presence of a railwayman gave road users added reassurance at the crossing. They felt safe.

The changing picture

1.4 Over the last 30 years, the nature of the protection provided for road users at level crossings has been and is still changing.

1.5 Today, less than half of the 1,900 or so public road level crossings are gated crossings. As part of a programme of modernisation it is British Railways Board (BR) policy to replace gated crossings within the next 10 years by modernised crossings. Where road traffic and operational conditions permit, the Board propose to install automatic half barrier or automatic open crossings. These crossings are train-activated. They speed up traffic flow. They are less costly to install and maintain than gated or barrier crossings. In BR's view and that of the Railway Inspectorate of the Department of Transport (DTp) they offer very high safety standards.

1.6 Successive Governments have supported BR's automation proposals. In 1978, a joint DTp/BR working party made proposals for simplifying the requirements for automatic crossings. The proposals were accepted by the then Government.

Public anxieties

1.7 We have been informed that at most sites at which automatic crossings have been installed, they have been accepted without objections. At some sites which have been automated, feelings are mixed with some uneasiness remaining. At some other places, the proposed introduction of automatic crossings has led to strong opposition. In such cases, feelings have run high. Expressed fears for children are paramount.

1.8 Our appointment stems from the Government's awareness of a concern for pedestrian safety. Earlier BR and Departmental studies including the 1978 joint working party report appeared to pay little attention to pedestrian concerns. It had been assumed, apparently, that the successful introduction of automatic crossings was essentially a matter of careful presentation and education.

Obtaining information

1.9 As part of our fact-finding we have visited a number of different types of crossings in various settings throughout the country. We have met local people and heard their views at public meetings. We are very grateful for their help.

1.10 We have sought views from interests both inside and outside the railways. Written evidence was invited from the public and from national organisations which directly or indirectly have a responsibility for pedestrians and their safety. A list of those who submitted evidence is at Annex A. Committee representatives made a one-day visit to the French Railways (SNCF).

1.11 We also judged it important to form an understanding of pedestrian behaviour at level crossings and of the opinions which people hold about the different types of crossings. We commissioned a number of studies from the Transport and Road Research Laboratory (TRRL) of the Department of Transport and the Accident Research Unit, Nottingham University.

1.12 In our public meetings we stressed that our task was not to reach a decision or view about any particular level crossing modernisation proposal. That is for the Government. Our remit was to carry out a general review of pedestrian safety at level crossings, to report and to make recommendations and to consider whether changes were justified.

The accident record

1.13 There have been very few accidents at level crossings involving pedestrians. The pedestrian accident rate at automatic crossings appears to be very low. It might be argued that in the apparent absence of a pedestrian accident problem there is little or no need for taking further preventive measures. It might be argued too that relative to pedestrian road users, pedestrians using level crossings are highly protected and more safeguards would not be justified.

1.14 We reject such arguments.

1.15 We hope to demonstrate that increased safeguards and provisions are not simply desirable but are a necessary part of BR's next phase of level crossing modernisation.

1.16 An increased level of safety provision has to be paid for. However, there seems little doubt that one of the reasons for the recent slow pace of the modernisation programme has been a lack of public confidence in the new types. Our proposals should enable some modernisation schemes to be implemented earlier than they would be otherwise and thereby release the cost savings earlier. To some extent therefore, we estimate that our proposals will be self-financing.

Our conclusions

1.17 Our report reaches three main conclusions.

1.18 *First,* we conclude on the evidence available to us and on accident statistics that automatic crossings are no less safe for pedestrians than the gated crossings they replace. However, there are qualifications: automatic open crossings are a relatively new type and the number of pedestrians using automatic crossings is as yet less than those using other types. Nevertheless, our surveys indicate that pedestrian behaviour at automatic crossings is very good.

1.19 *Second,* we are clear that insufficient weight has been placed in the past on the natural concern created by automation. It would be easy to dismiss the anxieties being expressed as a short-term reaction to radical change. However, these anxieties sometimes remain. We conclude that a much more determined effort will need to be made by BR to involve local people at the formative stages of a modernisation proposal. However, that in itself is not enough.

1.20 *Third,* we conclude that the present guidelines and criteria which apply to modernisation proposals make inadequate provision for pedestrians. A clearer set of principles and guidelines should determine these provisions. Pedestrians should be provided with more space, clearer separation and increased physical protection from rail and road traffic as traffic levels increase.

1.21 In short, whilst we quite appreciate and uphold BR's desire for progress with a programme of modernisation, increased efficiency and cost savings, we feel that this should not take place without additional guidelines and criteria, which reconcile the interests and natural fears of pedestrians.

CHAPTER 2

TYPES OF LEVEL CROSSING

2.1 In this Chapter we sketch the statutory framework governing level crossing protection and describe the main characteristics of the different types of level crossing as background to later discussion.

The statutory framework

2.2 From the beginning of the railways in Britain, trains have been given priority at places where railway lines cross a public road on the same level because of the train's long braking distances.

2.3 Also from the beginning of the railways, Parliament has imposed rules to protect road users at these crossings. Victorian law required railway operators to provide "good and sufficient" gates on each side of the railway, to provide crossing keepers and to maintain lodges for the keepers to live in.

2.4 Since the 1950s these obligations have been changed in various statutes. These have provided for the substitution of gates by lifting barriers and/or signals. The most relevant provision is Section 66 of the British Transport Commission Act 1957. This empowers the Secretary of State on the application of BR to make an Order requiring the Board to provide "barriers, lights, traffic signs and automatic or other devices". Thus, each proposal by BR for changing a gated crossing to a modern protection system requires the approval of the Secretary of State for Transport. Different and more complicated provisions apply to private railway undertakings; amending legislation is being promoted in this Parliament to put private railway undertakings on the same statutory basis as BR.

The role of the Railway Inspectorate

2.5 The Railway Inspectorate of the Department of Transport, which is independent of BR and indeed all railway undertakings, is responsible for advising the Secretary of State on safety aspects of every modernisation proposal. Every completed modernisation scheme is examined by the Inspectorate to ensure that the terms of an Order issued by the Secretary of State have been fully met. The Inspectorate is responsible for drawing up and maintaining the national safety standards governing level crossings. These standards are laid down in the Railways Construction and Operation Requirements for Level Crossings. They provide a guide to railway operators of the circumstances in which different protection systems can be employed and the technical standards to be fulfilled.

Consultation

2.6 There is statutory provision for local consultation when a modernisation scheme is proposed. The British Railways Board must give the local authorities affected (both County and District) notice in writing and provide a copy of the draft Order. Each local authority can make representations to the Secretary of State against the scheme within 2 months of the date specified in a draft Order.

MAIN FEATURES OF THE DIFFERENT TYPES OF CROSSING

Gated crossing

2.7 Gated crossings have heavy wooden swinging gates. Sometimes the gates are operated by hand by a crossing keeper. Alternatively they may be operated mechanically from a nearby signal box by rodding.

2.8 On heavily trafficked roads the gates are kept closed across the railway. Most gated crossings on public roads are interlocked with the railway signal system. This interlocking means that the gates are swung across the road shortly before a train is due so as to give the train driver an "all clear" signal. The time sequence from the start of the closure of the gates to re-opening is typically about three minutes.

2.9 At gated crossings where there is relatively heavy use by pedestrians they are usually provided with a wicket gate. At some crossings the wicket gates can be locked by the crossing keeper (or signalman) when a train approaches. These gates are sometimes locked a short time after the main gates to reduce pedestrians' waiting time. At unlockable wicket gates pedestrians are free to cross whenever they wish.

2.10 Gated crossings are expensive to operate and maintain. The British Railways Board estimate that a busy crossing involving a three man shift will cost about £30,000 annually in wages and overheads. If accommodation is provided the costs will be higher. The heavy rodding and control gear for opening and closing the gates is not only expensive but difficult to maintain and replace.

2.11 Gated crossings have another cost—delays to road users. These costs are borne by individual drivers and pedestrians.

2.12 Successive Governments have encouraged BR in their modernisation proposals which reduce some of these disadvantages. Modern level crossings fall into two distinct categories—manually controlled and automatic.

Manually controlled barriers

2.13 At these crossings, lifting barriers take the place of gates and, when down, offer road users full physical separation from trains. But whereas gates swing across the road, barriers move up and down.

2.14 There are generally four barriers, two at each side of the railway. The barriers when lowered extend across the full width of the carriageway and the footpath. The barriers are usually provided with "skirts". These "skirts" are of light construction and fill in the space between the lowered barrier and the road. As the barrier is raised the "skirt" folds alongside it.

2.15 Road traffic lights are usually provided to warn drivers and pedestrians of the temporary closure of the road. The standard sequence is a three second amber light followed by red lights.

2.16 The barriers are always interlocked with protecting railway signals. Until the barrier is lowered, the train driver cannot have an all-clear signal. The cycle is as follows. On the approach of a train, the signalman (or attendant) will start the barrier lowering sequence. The amber traffic lights show and the audible warning begins. This audible warning is more to inform pedestrians of the possible hazard from the descent of the barriers rather than the approach of the train. After about three seconds, the amber light is followed by twin flashing red lights and the barriers start to descend. Where pairs of barriers are provided, the offside barriers are not lowered until the nearside barriers are down. This pattern of closure ensures that there is an exit for vehicles and pedestrians after the nearside barriers have started to descend. When the offside barriers are fully down the signalman or crossing attendant checks that no vehicles or pedestrians are within the crossing area. When all the barriers have finally descended the audible warning stops but the red lights continue to flash.

2.17 After the passage of the train the barriers are raised in unison. The barriers are often raised automatically; the train itself activates the lifting action as it runs over a trigger mechanism on the track. That is the maximum extent of automation at manually controlled barriers. Even though the barriers may descend by electrical operation at the start of the cycle, the commencement of the operation is judged by and monitored by railway staff.

2.18 The operation of the barriers with closed-circuit television (CCTV) surveillance from a distant signal box is no different from the above procedures. The operation is still manually controlled, albeit remotely. There are additional safety provisions built into remote or CCTV crossings. If the main power supply fails at the crossing, or a barrier is dislodged, or the red traffic lights fail there are visual and/or audible warnings at the controlling point. If these warnings become activated, a railwayman is sent to the site to operate the crossing.

2.19 It is difficult to imagine a system which could appear to give pedestrians more protection from trains. There are full barriers which separate pedestrians from the train and the track. There are audible and visual warning signs to signal the approach of the train. And more generally, road users benefit from the considerably improved road lay-out which accompany many modernisation schemes.

2.20 From a railway viewpoint however, manually controlled barriers are an expensive protection system especially if operating under surveillance. The Board have estimated that the average cost of converting a gated crossing to a CCTV manually controlled barrier is approximately £140,000. The delay to road users is not reduced very much with these barriers. Using protective signals interlocked with the closure of the gates inevitably means that there will be appreciable delays to road traffic.

AUTOMATIC CROSSINGS

2.21 Where the Construction and Operation requirements allow, the Board seek to replace gated crossings by automatic crossings which are a less expensive form of protection.

Automatic half barriers

2.22 These level crossings have barriers which stretch across the left hand (nearside) of the road only. They are designed to ensure that no one can be trapped on a crossing after the barrier has descended. There is always an exit for vehicles and pedestrians.

2.23 The reason why a second pair of half barriers should not be introduced on the offside of the road is related to the automatic operation of the crossing. The descent of the half barriers is activated by the train. There is therefore no signalman or crossing keeper to check that the crossing is clear as at manually controlled barriers. The crossings are therefore designed so that escape routes exist for any vehicle or person within the crossing when the barriers descend.

2.24 Because the operation of these crossings is automatic, there are no protecting signals for the train driver. The train dictates the timing of the operation.

2.25 The crossing equipment is designed on a "fail safe" basis. That is, if there should be a failure of equipment, the normal protection arrangements should not be reduced. A critique was made of the equipment design provisions for level crossings by the 1978 Joint Working Party. Since our survey has shown that there is evident public concern about the safety of equipment we reproduce at Annex B the relevant paragraphs from the 1978 report.

2.26 Road users are warned of the approach of a train by the operation of the road traffic signals and by an audible warning which is intended primarily for pedestrians. Road traffic signals operate on the same cycle as for manually controlled barriers. Amber lights show for approximately three seconds, and they are then followed by flashing red lights. The barriers then start to descend and will be fully lowered about 17 seconds after the amber lights first start to flash. The audible warning sound ceases when the barriers have fully descended. The fastest train arrives at the crossing not less than 27 seconds from the start of the amber light. This interval is increased if the crossing is particularly wide. However any general extensions to the "closed" time have to be viewed in the light of their possible effect in encouraging drivers to zig-zag around the half barriers.

2.27 The barriers start to rise automatically after the train has cleared the crossing. However, if another train is approaching the barriers remain down unless at least 10 seconds would elapse after they have begun to rise before the operating cycle restarts for the other train.

2.28 Until recently it was the practice for a special flashing neon sign to be provided with the legend "Another Train Coming". However, this signal is not now fitted at new conversions. In its place is a fixed metal road sign with the legend "ANOTHER TRAIN COMING if lights continue to show".

2.29 At some automatic half barrier crossings, pedestrians are provided with wicket gates, generally only on the unprotected side of the road. But unlike those at gated crossings these wicket gates cannot be locked. This is by intent; if they were lockable, a pedestrian who entered the crossing after the cycle had started might be trapped (or feel trapped). The wicket gates at automatic half barriers are outward opening like those at gated crossings.

2.30 Where pedestrian traffic is heavy, guard rails may be provided at the footway edge and anti-trespass grids may be installed to deter people walking along the railway from the crossing.

2.31 For users the essential point about automatic half barriers is that they offer less than full physical separation from the railway. When trains approach, the discipline on pedestrians is imposed by traffic lights and audible warnings. Thus at automatic crossings pedestrians are expected to behave as they would at a road junction.

Automatic open crossings

2.32 These crossings, as their name suggests, have no physical barrier at all. For all practical purposes the level crossing looks like a road junction except that trains always have priority. The safety of pedestrians and motorists depends on their obeying the train-activated traffic lights and audible warnings.

2.33 The automatic open crossing operates in the same way as the automatic half barrier. The operating cycle is activated by the train "striking-in" at a certain point on the railway track. The same traffic light signal sequences occur. However at automatic open crossings, the audible warnings continue throughout the period when it is dangerous to cross the railway.

2.34 From a railway viewpoint, there are two types of automatic open crossing—one locally monitored, the other remotely monitored. From a user viewpoint, there is no practical difference.

2.35 The distinction concerns the method of ensuring that the road traffic signals are in working order and that the crossing is clear. At locally monitored automatic open crossings it is the train drivers who are responsible for making safety checks. The train drivers must conform to speed limits set to ensure that they can stop their trains before the crossing should they receive a warning signal. This warning consists of a flashing white signal beside the track some distance from the crossing. If that signal is not operative it indicates to the train driver that the road traffic signals are not working. In contrast to automatic half barrier systems, the "fail safe" provisions at automatic open crossings are therefore centred on train drivers. The speed limitation also means that the driver can halt his train if he can see that the crossing is blocked by road traffic. The train driver cannot of course stop the train if he sees a motorist or pedestrian enter the crossing at the last moment.

2.36 At remotely monitored automatic open crossings the safety checks of the equipment are carried out by signalmen. These crossings are new in design and we understand that the first will be introduced this year. They will be found mainly on secondary lines where there is very little road traffic and thus little risk of the crossing becoming blocked by road traffic.

2.37 The Automatic Open Crossings (AOC) represent a more cost-effective form of level crossing protection than any previous design. The British Railways Board estimate that an AOC locally monitored will cost on average about £20,000 to install. The average cost of installing a remotely monitored AOC is estimated to be about £40,000.

Other protection systems

2.38 To complete the picture we note that there are other less frequently-used protection systems. There are about 100 Open Crossings; these have no traffic lights. At these crossings, the road traffic is required to give way to the train as if crossing a major road. These crossings are found only on country roads. The train speed is limited to 15 km per hour (10 mph) and on a single line track.

2.39 In addition there are about 40 public road level crossings protected by miniature red and green warning lights. These lights indicate to road users when it is safe for them to open the gate or barrier themselves. It is Department of Transport and BR policy that this type of crossing will be gradually converted to other protection systems.

THE NATIONAL PICTURE: PAST, PRESENT AND FUTURE

Number of level crossings

2.40 Today, there are approximately 1,900 public road level crossings. Twenty years ago there were over 4,000; between 1961 and 1967 the number was reduced to present day levels mainly because of branch line closures.

2.41 The numbers and proportions of the different types of level crossing in use today are shown at Table 1. The past and future development of British Railways' modernisation programme is illustrated at Fig 1.

TABLE 1: **Numbers and types of level crossing (31 December 1982)**

	Number	*%*
Gated	804	43
MCB	415	22
MCB (CCTV)	183	10
AHB	254	13·5
AOC (L)	117	6
AOC (R)	0	0
OC	104	5·5
Total	1,877	100

Key: MCB — Manually controlled barriers
CCTV — Closed circuit television
AHB — Automatic half barriers
AOC (L) — Automatic Open Crossings (locally monitored)
AOC (R) — Automatic Open Crossings (remotely monitored)
OC — Open Crossings

Source: British Railways Board (provisional estimates)

2.42 There are two important points to be noted about Fig 1. First, it is striking that since 1967 the main instrument of BR's modernisation programme has been manually controlled barriers. There has been very little increase in the number of automatic half barriers. Over 80% of the automatic half barriers in use today were installed before 1967.

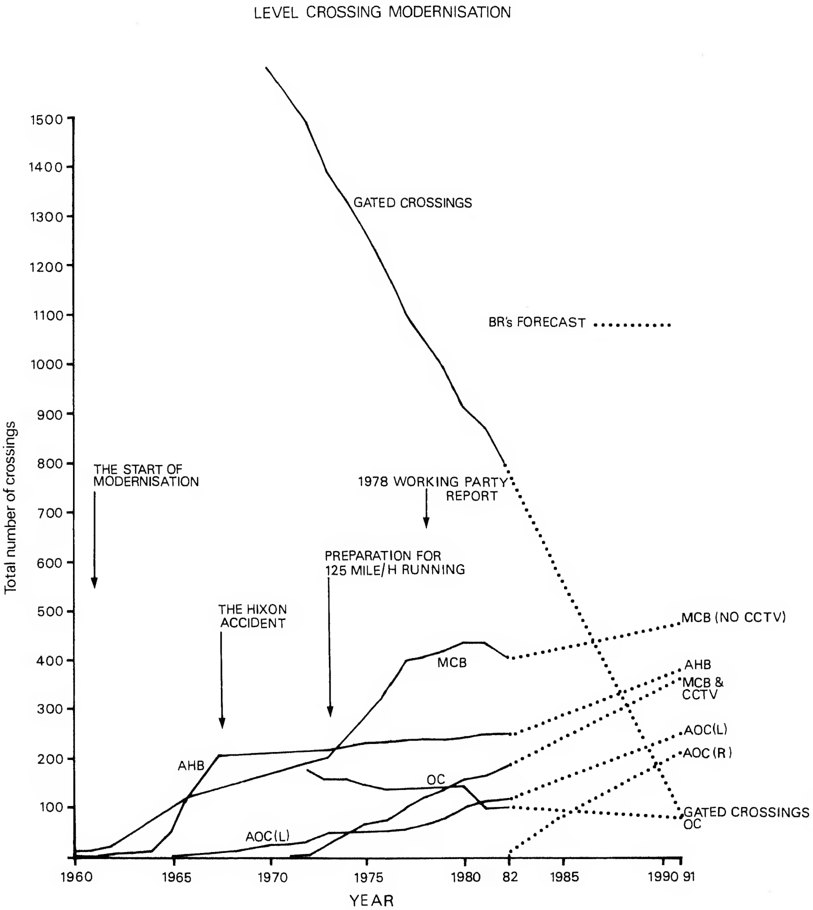

FIG. 1

2.43 Second, the modernisation programme which the British Railways Board have in mind for the next decade will involve some changes in emphasis. There will be an increasing use of CCTV for manually controlled barriers and a major increase in the use of the automatic open crossings. These changes are shown at Table 2 below.

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TABLE 2: **Present and future distribution of level crossings (by type)**

Type	*Current (Dec 1982)*			*Future at Dec 1991**		
	Number	*%*		*Number*	*%*	
Gated	804	43		100	5**	
MCB	415	22		465	25**	
MCB (CCTV)	183	10		350	19	
AHB	254	13·5	19·5	375	21	46
AOC (L)	117	6		248	14	
AOC (R)	0	0		209	11	
OC	104	5·5		90	5	
Total	1,877	100		1,837	100	

* as estimated by British Railways Board

** assumes a closure rate of 10 level crossings per annum from December 1981 (1937 level crossings)

2.44 From the viewpoint of users, the most noticeable change will be the increased emphasis on automatic open crossings. About one quarter of sites will be converted to this type.

2.45 Examples of the main types of crossing are shown at Figs 5–8 (pages 35 to 39).

CHAPTER 3

PEDESTRIAN ACCIDENTS

3.1 In this Chapter we assess the pedestrian safety record of different types of crossings. Our remit does not direct us specifically or solely to automatic crossings. However, given the background to our appointment and the direction of BR's modernisation programme, it is inevitable that we should focus on these types.

Risk and protection

3.2 We all accept some measure of risk as part of the price of our personal mobility. The public has however always had high expectations of safety on the railways. The fencing of all railway tracks and the provision of gates or barriers at public road level crossings are both aspects of these expectations. Physical separation between rail traffic and road users has been part of our culture for over a century and equated with safety and protection. Inevitably, there is strong resistance to anything less when modernisation is proposed.

3.3 Safety is not an absolute concept. There is no single, unambiguous yardstick for assessing the level of safety of pedestrians at different types of level crossing. There is no doubt that people *feel* totally safe with gates or full barriers. Our survey bears this out. But feeling safe and being safe are not necessarily the same thing. We can form some assessment of relative safety levels by comparing the accident and casualty rates at the different types of crossing.

Characteristics of automatic and gated crossings

3.4 There are two distinctive characteristics of automatic crossings which bear directly on any assessment of comparative safety levels. First, at automatic crossings the final responsibility for deciding whether or not to cross is placed on road users. Second, the operation of the automatic crossing is designed to be "fail-safe".

3.5 These characteristics are reversed at many gated crossings. Decisions on releasing lockable wicket gates and therefore on when to cross are out of the hands of pedestrians and in the hands of crossing keepers. And the safe operation of gated crossings depends on the response by train drivers to signals and on the judgements of crossing keepers. If the gates are not interlocked with protecting signals, then road users are even more vulnerable to human mistakes.

3.6 In short, provided the visual and audible warnings are clear and easily understood and road users obey the instructions given, then automatic crossing will be safe. There can be no question of crossing keepers or signalmen intervening between the train-activated signals and road users.

3.7 It follows therefore that accidents at automatic and at manned crossings will be different in character. We can expect pedestrian accidents at automatic crossings to be largely if not wholly attributable to pedestrian behaviour. In contrast, we can expect a higher proportion of accidents at gated crossings to be attributable to failures of the railway equipment or mistakes by railway staff.

Accident evaluation

3.8 It is important at this point to clarify the meaning of the term "accident" used above. An accident at a level crossing as recorded by the Department of Transport's Railway Inspectorate does not necessarily involve a fatality or indeed any injury. For example, a train might drive through a Danger signal and crash into the gates when the crossing was not being used by pedestrians or motorists. That would be reported to the Railway Inspectorate as an "accident". The Inspectorate include accidents of this type in their safety evaluations since it is a matter of chance whether or not they involve road users. Previous investigations into level crossing safety have adopted the same convention in judging the relative safety of different types of crossing. It has become the practice to evaluate relative safety levels by dividing the total number of accidents over a given period by the average number of level crossings and to express the result as a rate in terms of accidents per 100 level crossings.

3.9 We accept that the concept of an "accident" rate is one indicator of the nature of the potential risks to road users at different types of crossings. But as we suggest in paragraph 3.7 above, it is relevant to distinguish between:—

(i) accidents which are attributable to failures of railway equipment or staff;

(ii) accidents which are attributable to pedestrians; these will almost certainly involve injury and generally a fatality.

Railway system failure rates

3.10 With that in mind, we set out at Table 3 below, a modified version of the accident analysis which is produced annually by the Department of Transport. Table 3 gives the rate of failure of the railway system for each type of crossing. None led to the injury of a pedestrian. As one would expect, gated crossings have a much higher propensity to railway-operator failures than have automatic crossings which are designed to be "fail-safe". Put more starkly, there have been 144 occasions over the past 5 years when trains have collided with level crossing gates. There is no direct equivalent of course at automatic crossings. However, a parallel would be the arrival of a train at an automatic crossing without prior warning. This aspect of the failure of automatic crossings is referred to in Chapter 2 and Annex B.

TABLE 3: **Railway System Failures—Level Crossings (1973–1982)**

	Gates	*MCB*	*AHB*	*AOCL*
Average annual number of incidents	42	1·5	0·5	0
Incident rate per 100 crossings per year	3·6	0·11	0·22	0

Key: Gates —gated crossing
MCB —manually controlled barrier
AHB —automatic half barrier
AOCL —automatic open crossing—locally monitored.
Source—DTp—Railway Inspectorate. (Data includes provisional estimates for 1982)

3.11 We should note one qualification about the table. There is no weighting of the incident rate to reflect differences in the average pedestrian flow at each type of crossing. It is probable that more pedestrians use gated crossings and manned barriers than use automatic crossings.

Pedestrian casualty rates

3.12 Because the road user warning systems for automatic crossings are activated by oncoming trains and are fail-safe, they are technically safer than the gated crossings they replace. However the question remains whether people use the automatic crossings safely. Table 4 gives average annual pedestrian casualty rates for accidents which can be attributed wholly or partly to the users.

TABLE 4: **Pedestrian Casualties (Fatal and Injuries) 1973–1982**

	Gates		*MCB*		*MCB(CCTV)*		*AHB*		*AOCL*		*TOTAL*	
	K	I	K	I	K	I	K	I	K	I	K	I
Number killed and injured over 10 years	13	4	0	1	0	0	5	1	0	1	18	7
Average number killed and injured annually	1·7		0·1		0	0	0·6		0·1		—	
Average number of crossings	1,100		372		107		230		75		—	
Casualty rate per 100 crossings	0·15		0·03		0		0·26		0·13		—	

Key: K —Killed
I —Injured
Gates —Gated crossing
MCB —manually controlled barrier
MCB(CCTV) —manually controlled barrier (with closed circuit television)
AHB —automatic half barrier
AOCL —automatic open crossing—locally monitored
Source—DTp—Railway Inspectorate. (Data includes provisional estimates for 1982)

3.13 The qualification expressed in paragraph 3.9 applies to Table 4. If, as paragraph 3.9 suggests, there is a higher average pedestrian flow at gated crossings than at automatic ones, then the latter's accident rate will be understated relative to gated crossings.

3.14 There are four striking points about Table 4. First, the scale of the casualty levels. Table 4 indicates that over the past decade on average two pedestrians have been killed annually at the 1,900 or so level crossings. In absolute terms therefore the number of casualties is fortunately very small. It is notable that 69,000 pedestrians were killed or injured annually over the same period on the roads. In scale, therefore, pedestrian safety problems are of a different order at level crossings and on public roads generally. But the two are not comparable since the scale and nature of vehicle and pedestrian traffic in the two circumstances are so very different.

3.15 Second, automatic half barriers have a higher casualty rate than gated crossings. Are the differences significant? The casualty rate of 0·26 per 100 crossings per year implies that perhaps 2 or 3 people (per 100 crossings) could be killed or injured at automatic half barriers over the next decade. The corresponding casualty rate of 0·15 for gated crossings means that perhaps 1 or 2 people (per 100 crossings) may be killed or injured at these crossings over the next decade.

3.16 A commonsense view of these figures would be that there is little or no practical difference between the casualty rates which are both very small. Comparisons involving such small numbers have to be treated with caution. Because there are so few casualties, a small annual change in the number of incidents or in the way in which casualties are recorded and classified could produce an apparent dramatic decrease or increase in the accident rate. For example, of the 6 "pedestrian" casualties at automatic half barriers, one was a cyclist and one a motorcyclist. If these casualties had been classified as non-pedestrian, then the casualty rate would not be 0·26 but 0·17 (per 100 crossings per year).

3.17 The third notable feature of Table 4 is the safety record of manually controlled barriers and the impeccable record of such barriers when monitored by closed circuit television (CCTV). This record is not surprising. Road users are physically separated from approaching trains; wicket gates are rare so access is prevented. And the crossings are supervised by signalmen who check that the crossing is clear before giving the train the "all-clear" signal. The nature of CCTV surveillance is such that a signalman's professional attention is focused on the monitoring screen at the critical time.

3.18 This degree of protection inevitably is expensive as we have discussed in Chapter 2. On average, a manually controlled barrier with CCTV costs 7 times as much as an automatic open crossing. We return to the question of cost and benefit in Chapter 7.

3.19 The fourth notable feature of Table 4 is the low casualty record at automatic open crossings although as paragraph 3.21 notes, experience of this type of crossing is not extensive. There has been one pedestrian casualty since this type was first introduced. There is some doubt whether that accident, which happened 9 years ago, occurred at the crossing in question.

3.20 Here is an apparent paradox. The crossing which offers the *least* form of physical separation from trains is one of the *safest* to date in terms of casualty levels. But as we later report in the next Chapter, it is the crossing at which pedestrians seem to feel the least safe and like using least. There is therefore no real paradox. Perhaps because people are conscious of the risks, they recognise their responsibility for self-protection and respond to the various visual and audible warnings.

3.21 Two important qualifications need to be placed alongside the accident rate for automatic open crossings. Although automatic half barriers have been established in this country for about 20 years in substantial numbers, the automatic open crossing in its present form is a more recent system. Second, it has to be borne in mind that almost all automatic open crossings are currently found on lightly trafficked railway lines with relatively few pedestrians.

3.22 But that said it is notable that in Holland, where there are apparently over 800 automatic open crossings sited in urban and rural areas and designed on similar lines to those in this country, the pedestrian casualty rate is in line with experience in Great Britain. And in France, where there are still 300 of this type, there has been only one pedestrian injured over the last nine years at such crossings.

3.23 In the rest of this Chapter we consider two questions:—

(i) whether there is any evidence to show that the number of pedestrian accidents at the different types of level crossing is increasing or decreasing over time;

(ii) whether there are common features in the pedestrian casualties which might point to remedial action.

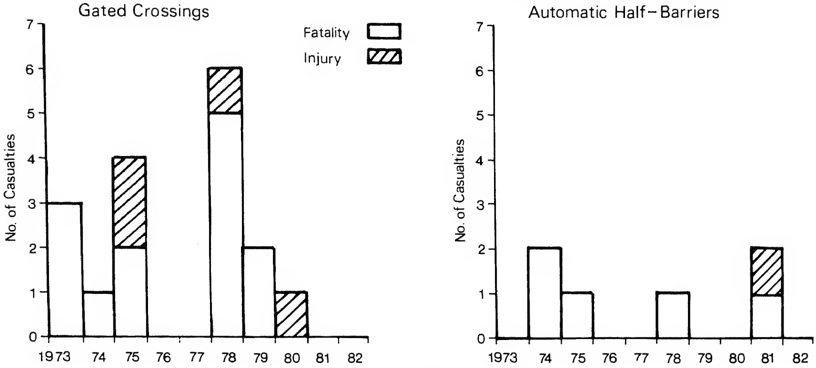
TIME ANALYSIS

3.24 Fig 2 shows the incidence of the pedestrian casualties which have occurred over the period 1973–1982, for both gated crossings and automatic half barriers.

3.25 There is no trend apparent. The frequency of the casualties is random. There have been long periods at both gated and half barrier crossings when there have been no pedestrian casualties.

3.26 On the basis of the casualty figures there is no factual evidence to suggest that the present mix of automatic crossings presents any more (or less) of a risk to pedestrians nowadays than they did 10 years ago. It would seem from the casualty figures that the behaviour of pedestrians is very good.

INCIDENCE OF PEDESTRIAN CASUALTIES (1973–1982)


Gated Crossings

Automatic Half-Barriers

FIG. 2

3.27 So far as gated crossings are concerned, the Chief Inspecting Officer of Railways noted in his Annual Report for 1981 that the closure of the more dangerous gated crossings and reduced rail traffic may have contributed to the absence of accidents and casualties at gated crossings that year. We discuss below where the present dangers exist for pedestrians.

ACCIDENT ANALYSIS

Accident forms

3.28 We asked the Transport and Road Research Laboratory (TRRL) to analyse the available Accident Report Forms for pedestrians at level crossings over the last 10 years to assess whether they had anything in common. In their analysis, the TRRL have commented that the reports are limited in detail, in contrast to police accident report forms for injury accidents on the road and the more comprehensive data requirements for road fatalities.

3.29 It is obviously important from a safety management point of view to collect comprehensive information about accidents and casualties at level crossings. Accident analysis is only as good as the data on which it is based.

3.30 We therefore *recommend* that the Railway Inspectorate take stock of the present reporting arrangements for accidents at level crossings to assess the scope for bringing these more into line with police reporting for road accidents.

3.31 This recommendation will not affect the reporting of accidents between pedestrians and road vehicles at level crossings. Such accidents are treated as though they were on a public road. Here the normal police arrangements already apply.

Road accidents

3.32 It is pertinent to note here that pedestrians are at risk at level crossings not only from trains but from road vehicles. Indeed, the layout of some gated crossings and also of some modernised crossings is such that road vehicles are a greater hazard to pedestrians than trains. Pedestrians and road vehicles can be competing for the same limited road space; inevitably the pedestrian comes off the worse. According to statistics provided to us by TRRL, over the period 1970 to 1978 there were 84 pedestrian casualties resulting from *road* vehicle accidents on level crossings: 1 fatal, 27 serious and 56 slight injuries.

3.33 These road accidents represent a pedestrian road casualty rate of 0·42 per 100 crossings per year. This compares with a train casualty rate of 0·15 for a gated crossing and 0·26 for an automatic half barrier per 100 crossings. Pedestrians using level crossings would seem to be more at risk from being injured by a road vehicle than by a train. We return to this issue in Chapter 5 where we discuss the importance of providing pedestrians with adequate footway space.

Gated crossings

3.34 The TRRL analysis related to 13 accident report forms. The key points which emerge from that analysis are:—

(i) 10 of the casualties resulted from pedestrians using non-lockable wicket gates when a train was approaching;

(ii) 2 of the casualties resulted from pedestrians using lockable wicket gates which had been inadvertently released.

3.35 It would seem that the crossing users were local people and therefore would know the operation of the crossing well. The unlocked wicket gates would not of course be protected either by visual or audible warnings. The only reminder of the approach of the train would be the closed main gates. In short, non-lockable wicket gates at gated crossings are a potential hazard. They invite the pedestrian to cross without offering any protection or warning of approaching trains. But even lockable wicket gates are not a guarantee of safety.

Automatic half barriers

3.36 The casualties at automatic half barriers reflect misjudgements of different kinds. As we noted in paragraph 3.16 two of the casualties involved two-wheeled vehicles. Of the others, it is likely that the users crossed on the "open" side of the crossing either disregarding or oblivious to the warning signals. But there seem to be no other common features. The crossings differed in character. Some had very few pedestrians and a high volume of trains, whereas at others the converse applied. All the crossings had been in operation for a number of years. We discuss later how stronger visual and audible warnings and improved crossing layouts might reduce even further the number of such casualties.

3.37 It is useful to note here the conditions not present amongst these casualties. During the course of our evidence-gathering, three fears about automatic crossings have been repeatedly expressed:—

(i) children are the most vulnerable and will dodge around or under the barriers;

(ii) the time allowed for people to cross after the amber warning light has started is insufficient for elderly people;

(iii) the absence of a physical barrier across the railway when the road is open will mean that children will be allowed near the "third" rail and will be electrocuted.

3.38 We understand these anxieties. But the fact remains that the beliefs which people hold are not necessarily supported by the facts. No young child has been injured by a train at automatic crossings and as we later discuss there is no evidence to date to show that children behave dangerously. Moreover, they are afforded less protection by an unlocked wicket gate than an automatic crossing, where there are visual and audible warnings.

3.39 We were not convinced ourselves at the outset of our task that the minimum crossing time of 27 seconds was sufficient. However, we observed an elderly, disabled lady cross extremely slowly but safely. We would not want the timing to be less. Equally, there are dangers from increasing the timing and adding on an additional margin for error. The regular crossing users (including motorists) would realise the extent of the margin and behave accordingly. Danger would then arise from misjudgements of the margin.

3.40 So far as danger from the electrified third rail is concerned, there is provision in the Department of Transport's Construction and Operation Requirements for anti-trespass guards to be provided alongside the crossing. We have no evidence that children behave in a way which would put them at risk from the "third" rail. They do not seem to behave in a foolhardy way at gated crossings with wicket gates or at manned barriers where they are not physically separated from the third rail.

3.41 To sum up we would judge on the evidence available to us and on accident statistics that automatic crossings are no less safe than the gated crossings they replace. However, that assessment is subject to one important qualification. The "average" automatic crossing is often in a rural setting and is not intensively used by people on foot. If that set of circumstances were to change and if the conversion to automatic types of crossings in towns used by many pedestrians were to become common then past experience would not be particularly relevant to the new conditions.

3.42 We discuss in Chapter 5 how we envisage the interest of pedestrians being further safeguarded in those circumstances.

CHAPTER 4

PEDESTRIAN OPINIONS AND BEHAVIOUR

4.1 We were concerned to understand the nature and strength of pedestrian opinions of different types of level crossing. We also considered it important to find out about pedestrian behaviour since safety at automatic crossings depends on obedience of traffic signals and audible warnings.

Obtaining the information

4.2 We therefore commissioned some studies from the Transport and Road Research Laboratory (TRRL) of these aspects based on 12 level crossings of different types. The studies were conducted by the Accident Research Unit of Nottingham University in conjunction with TRRL. This is the first occasion on which the subject has been studied in depth.

4.3 Although the small number of crossings investigated is necessarily not a representative sample of the 2,000 or so level crossings, we would expect the main types of behaviour and opinion to have been identified.

4.4 In total, the behaviour of 5,000 people was observed at 6 sites and almost 600 interviews were conducted at a further 6 sites. The types and numbers of the sites in the sample were as follows:—

Observations of pedestrian behaviour

Type of crossing	*No of sites observed*
Gated crossing	1
Manually controlled barriers	2
Automatic half barriers	2
Automatic open crossing	1
Total	6

Opinions of pedestrians

Type of crossing	*No of sites in sample*
Gated crossing	3
Automatic half barriers	2
Automatic open crossing	1
Total	6

4.5 The following paragraphs summarise the key findings from the studies.

Opinions

4.6 First, the opinions of the people who were interviewed. At all sites, at least 80% of the respondents used the level crossing once a week or more. It is clear that gates and barriers are associated with safety. When people were shown pictures of the different types of level crossing, those with full barriers or gates were consistently highly rated and open crossings were thought to be the least safe by respondents at all sites. At open crossings and automatic half barrier crossings, people have a fear of others seizing the chance to cross the path of an approaching train and taking the risk of being involved in an accident. The majority of people think that children under the age of 11 and adults over 60 are most at risk.

4.7 People interviewed at manned crossings also place emphasis on the role of the railway operator who is on hand, it is believed, to deal with any eventuality. The public feel more confident about all safety aspects at the crossing when an operator is employed—to cope with stopping the train, stopping motorists or pedestrians and overseeing children and animals should they get on the track.

4.8 In contrast, the risk of failure of automatic crossings concerns many people, although it is clear that people do not know how the automatic system works. A smaller percentage of people at the automatic crossings thought manned to be safer than automatic. Perhaps once installed some people place more trust in automatic systems.

4.9 At all three automatic crossings, more than 80% of people reported that lights indicated to them that a train was approaching. The percentage reporting hearing a warning sound and, where relevant, seeing the barriers descend varied among sites. At the automatic open crossing, almost 90% said that they heard a warning sound compared with 45% and 70% at the two automatic half barrier crossings. At these latter crossings, the audible warning stops as soon as the barrier has descended; at the automatic open crossing the warning continues throughout the closure cycle. At the two automatic half barrier crossings, 38% and 21% mentioned barriers descending.

4.10 We were concerned to find out whether people had changed their opinions after modern crossings had been installed. At automatic crossings, respondents were asked how they felt about the new crossing before and after it was installed. At these crossings, about 40% of people said they now liked the crossing. At the automatic open crossing, two-thirds of the respondents said that they had disliked the crossing at the time of the conversion, with lower proportions at the two automatic half barrier crossings. Taking all three together, nearly one-third of those respondents who were originally opposed to automation of the crossings reported that they now liked the new system; there were only two instances of change of opinion in the opposite direction. It is therefore clear that opinions can change in favour of automatic crossings, although the variation in responses among the sites suggests that local factors play an important part in this. It is also clear that despite this change in opinion, a substantial minority of people still reported that they did not like automatic crossings.

4.11 We were also concerned to know how people would feel if the gated crossing which they used was to be converted to an automatic crossing. When respondents at the gated crossings were shown pictures of either an automatic half barrier or an automatic open crossing and asked how they would react to a change, the replies were predominantly critical. The number of respondents who were critical out-numbered those who were in favour or indifferent by a ratio of 2:1 when shown a picture of an automatic half barrier but by 4:1 by those who were shown a picture of an automatic open crossing.

Behaviour

4.12 There are three main aspects of behaviour which emerge from the studies. First, the study team observed a high level of obedience of the audible and visual warnings by people of all age groups.

4.13 Out of about 850 observations at automatic half barrier crossings, no pedestrian was seen crossing after the half barrier had descended. At the automatic open crossing (650 observations) no pedestrian was seen crossing after the warning lights and sounds had started. Three pedestrians at automatic half barriers (850 observations) were crossing when the lights were on amber or had turned to red.

4.14 There is some conflict between this observation and the views expressed in the opinion survey. Many people said that they have seen others cross during the warning period at automatic crossings. There are a number of different answers to this conflict of perceptions. It is possible that the sites selected for the observations and the period over which they were made were not sufficiently extensive to reflect all shades of behaviour. On the other hand, the views which people expressed about others did not have any measure of the frequency of the breach of the warnings and could not of course be verified.

4.15 Second, at the sites with wicket gates there was a higher percentage of pedestrians walking outside the white lines which designate the pedestrian footpath. This is illustrated at Fig. 9 on page 40. The tendency is for the wicket gate route to be used as road vehicle flow increases. Stepping outside the markings, rather than using the wicket gates increases the chances of pedestrians becoming involved in conflict with approaching road vehicles. At some crossings it was the younger children who used the wicket gates and stayed within the marked area. In particular, adults with prams were frequently seen entering the road to avoid going through wicket gates.

4.16 Third, there was a consistent pattern in the supervision of children at all sites. Very few children under the age of five were unaccompanied as indeed one would expect. In the age range five to seven almost one quarter were unaccompanied, the figure rising to almost 80% for children aged eight to ten and 97% for children aged eleven to fourteen.

CHAPTER 5

PEDESTRIAN CRITERIA

5.1 During the course of our deliberations we have returned again and again to one question. Is it sufficient to have the line between safety and danger at automatic crossings marked by a white line plus visual and audible warnings? The accident statistics would suggest that it is sufficient. Yet the public does not believe it to be so as is shown by the TRRL/Nottingham studies. The anxieties of parents were forcefully impressed on us when we took evidence from the public. We understand their fears.

Automatic full barriers

5.2 We have considered the feasibility of train-activated full barriers which would offer the benefits of automation and full physical separation from trains. This idea was considered very thoroughly at the time of the 1968 Inquiry* and rejected. Automatic full barriers present safety hazards. It would be possible for a driver or pedestrian to become (or feel) trapped between the barriers. With manually controlled barriers, this should not happen. The signalman first checks visually that the crossing is clear before all barriers are brought to their lowered position.

5.3 There is an automatic full barrier system in use in France. We have seen the system in operation and have been provided with pedestrian accident statistics for this form of crossing by the French Railways (SNCF). As Annex C shows, the pedestrian accident rate for automatic full barrier crossings is higher than that for other types of automatic crossing. Whilst this may be attributable to a higher rate of pedestrian exposure (these crossings are almost invariably installed in urban settings), the SNCF believe that the automatic full barrier system is, in principle a less safe form of crossing than half barriers for the reason outlined in paragraph 5.2.

5.4 We have considered the feasibility of train-activated "mini" barriers which would extend across the pedestrian threshold to crossings. However these would be unsatisfactory also. The greater part of the road would be open still. There could be no guarantee that pedestrians would be deterred from using the crossing since they could easily skirt around or avoid the mini-barrier.

5.5 We conclude after full and careful consideration that attempts to combine the characteristics of gated or full barrier crossings with those of automatic half barrier or open crossings would be impractical and ineffective.

5.6 As we have discussed in Chapter 3, manned, manually controlled and automatic crossings offer different kinds of "protection". The presence of full barriers or gates provides a physical, tangible obstacle to pedestrians. In contrast, at automatic crossings audible and visual warnings give clear instructions which ensure total safety from trains when obeyed.

5.7 Given these two very distinct and different systems, a further question arises. Are there circumstances in which pedestrian requirements justify a form of crossing which gives a higher grade of physical separation from trains than automatic crossings? We believe there are.

Our approach

5.8 Our general approach to pedestrian safety is based on the proposition that as flows of people on foot, of road vehicles and of trains increase each requires more space for itself, clearer separation from the others and greater physical protection for the more vulnerable groups.

5.9 We have considered the present criteria for level crossing protection as they affect pedestrians against the broad test described above. In doing so we have borne in mind that the term "pedestrian" covers a wide range of young and adult users; those in wheelchairs and those with prams or push chairs. We have also had in mind that level crossings are used as roads for over 90% of the time.

The present criteria

5.10 When a level crossing is modernised three main factors determine which type is the most suitable:

(i) the speed of the train on the line;

(ii) the prospect of road vehicles "blocking" back on to the crossing;

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of the Public Inquiry into the Accident at Hixon Level Crossing: 1968 (Cmnd. 3706)

(iii) and for one type of crossing only (the Automatic Open Crossing, Remotely Monitored) the volume of trains and of road vehicles;

None of these takes account of pedestrian flow.

5.11 The general effect of these criteria has been to create a pattern in which:

(i) manually controlled barriers are installed on main lines and built up areas;

(ii) automatic half-barriers are installed in rural or semi-rural settings;

(iii) automatic open crossings are installed on lightly trafficked lines and predominantly in rural areas.

The changing picture

5.12 Notwithstanding the pattern just described, a number of crossings do not fit into it. In part these exceptions reflect local variations in applying the national standards. They also reflect changes to the national standards themselves and a gradual shift in emphasis. Furthermore we understand from BR that modernisation during the next decade will not solely involve the replacement of gated crossings. Some of the early manually controlled barriers and automatic half barriers will be due for replacement over the next few years. If the criteria allow, BR envisage the replacement of some of these by automatic open crossings.

5.13 BR's view is that with the exception of the remotely monitored automatic open crossing the volume or type of road traffic should not in itself dictate the choice of type of level crossing. They believe that in modern road traffic conditions it is largely unnecessary to use physical barriers to control road traffic at level crossings.

5.14 In line with this viewpoint, which seems to be broadly shared by the DTp Railway Inspectorate, BR believe that if a particular type of level crossing offers time-cycles and highway alignments that are practicable for road vehicles it will be satisfactory for pedestrians. We do not necessarily agree.

Need for safeguards

5.15 BR and the Railway Inspectorate have pointed to the low accident rate for pedestrians at automatic crossings as an indication of their safety. However, the national experience of the safety of automatic crossings is almost entirely related to crossings with light pedestrian traffic and/or relatively few trains. This is shown at Fig. 3. We have very little knowledge of the behaviour and interactions of large groups of pedestrians at extremely busy automatic railway level crossings. It is possible that the high standard of discipline which is evident at existing automatic crossings would be sustained through a hierarchy of increasing volumes of pedestrians, trains and road traffic. But there is little national experience to go on at the extremes of pedestrian and rail traffic intensity. We believe some safeguards are necessary.

5.16 It is also evident to us that the design and layout arrangements for pedestrians vary considerably from one site to another. It is policy to provide pedestrians with marked paths at modernised crossings. Indeed we have seen commendable examples where such paths to and through modernised crossings are very clearly marked and spaciously set out. But we have seen examples at other modernised crossings where the path for pedestrians has been unattractive and cramped, causing pedestrians to mingle with road vehicles. Yet such dangers are no less important or worrying than those from trains. On the contrary, at sites where the road may be in use as such for at least 90% of the time, they are significant. Level crossings should not be unattractive or a hazard to use from any viewpoint.

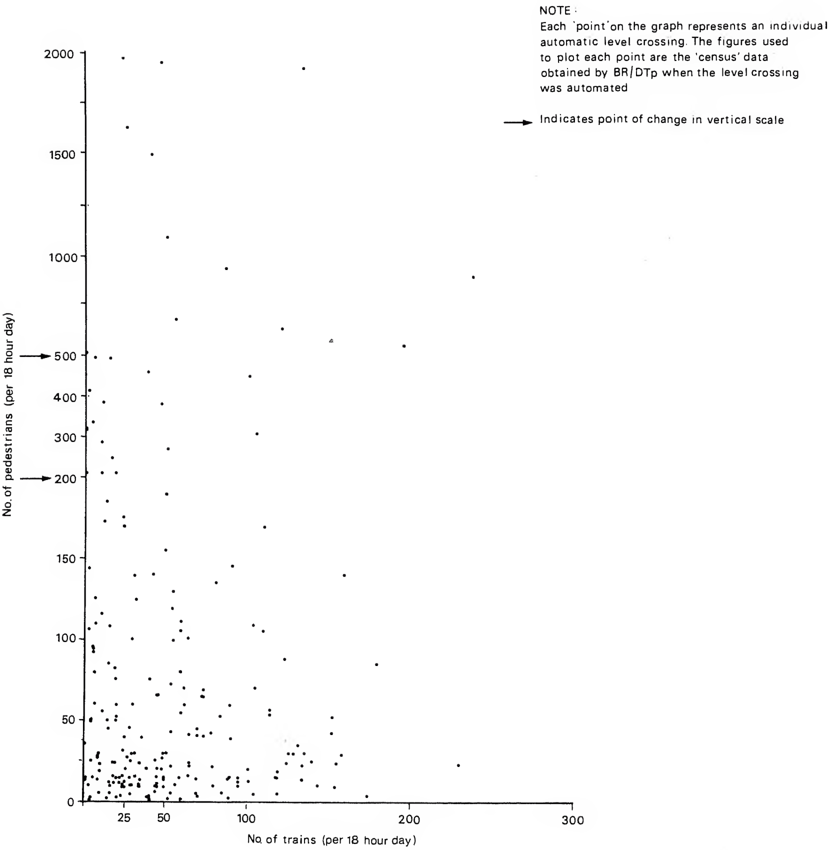
5.17 Our impression is that in the past the design of the crossing has been approached from two perspectives; one of railway operation and the other of road traffic management. We understand why that should be. But we believe there is scope for improving pedestrian provisions at level crossings without of course impinging on the safety of other road users or on railway safety.

5.18 In subsequent paragraphs we set out the features which we believe should in future form part and parcel of modernisation schemes from the quietest type of level crossing to the busiest. The recommendations follow the broad approach set out in paragraph 5.8, emphasising the varying importance of *space, physical separation, physical barriers* and *warnings.*

The approach to the crossing

5.19 The vast majority of pedestrians who use a level crossing will be people who live, work or shop, or go to school near the crossing and use it frequently. A small proportion will be visitors to the area or local people who use the crossing infrequently.

DISTRIBUTION OF VOLUMES OF PEDESTRIAN AND TRAIN TRAFFIC
AT A SAMPLE OF BR AUTOMATIC CROSSINGS



NOTE:
Each 'point' on the graph represents an individual automatic level crossing. The figures used to plot each point are the 'census' data obtained by BR/DTp when the level crossing was automated

→ Indicates point of change in vertical scale

FIG 3

5.20 For strangers, the first formal indication of the presence of a level crossing will be the advance warning road sign. It is, of course, primarily designed for road traffic. At all but automatic open crossings, the picture displayed is of a five bar gate.

5.21 At automatic open crossings, the picture displayed on the road sign is of a steam train. It is not entirely clear to us why two different road signs should be thought necessary. Although the question of road signs is outside our remit, we *recommend* that uniformity should be achieved, if necessary within an international code.

The context of the crossing

5.22 Advance road signs are much less important for pedestrians than for motorists. For pedestrians it is rather the crossing equipment itself and its context of ancillary railway buildings and fences that will set the crossing apart from the rest of the adjoining road. The presence of distinctive railway buildings, their architectural style and the colours used cannot help but make an impact. In remote areas where there is no distinctive adjacent railway property such as a signal box, the presence of an automatic crossing is heightened by special warning signs. We *strongly support* the continued use of these signs which indicate that care needs to be taken.

The crossing and its immediate approach

Space and physical separation

Light traffic

5.23 At the quietest crossings, which will be found in rural areas and characterised by very light pedestrian and train flows, we *recommend* sufficient space should be provided and clearly marked on the level crossing itself so that pedestrians and vehicular traffic are comfortably separated, whether or not there are footways on the approach to the crossing.

5.24 At less quiet crossings, where there are footways on the approaches to the crossing, we *recommend* that a pedestrian route should be clearly and unambiguously marked so as to link the footways on each side.

5.25 At crossings with heavier pedestrian and heavy road traffic flows but low train traffic we *recommend* pedestrian guard rails be installed between the footway and the carriageway. These guard rails should extend for at least 3 metres (about 10 feet) on all sides of the crossing. Since guard rails are usually set approximately 500 mm (1½ feet) from the edge of the carriageway and thereby narrow the footpath, we *recommend* that the width of footways be increased accordingly where at all practicable. Where widening is not practicable we believe the importance of protecting pedestrians from road vehicles justifies placing the guard rail closer to the road. In all cases, footways at level crossings should be wide enough to allow pedestrians (including those with prams) from both directions to pass comfortably, both on the approach to the crossing and on the crossing itself.

Medium traffic; higher grade separation

5.26 At automatic crossings where flows of pedestrians and road traffic are heavy and trains are relatively frequent, we *recommend* a higher grade of physical separation between pedestrians and trains. Guard rails should be provided between the footway and carriageway *and* partially across the threshold of the crossing to the railway. The guard rails would be used to mark out clearly the route to the crossing and delineate the area within which pedestrians can wait safely when the audible and visual warnings start to signal the approach of a train. At automatic half barrier crossings, the "threshold guard rail" would generally only be required on the "open" side of the crossing. An illustration of an automatic open crossing with such high grade separation is at Fig. 4.

Dense traffic; full physical separation

5.27 At crossings which have the heaviest pedestrian and train traffic we *recommend* manually controlled barriers. These may be justified even if road traffic is light because of possible risks to pedestrians from the crowd effects noted in paragraph 5.15. Where road traffic is heavy, pedestrian guard rails would also be appropriate.

The wicket gate

5.28 We have considered carefully whether wicket gates should also be used to increase the level of separation between pedestrians and trains at busy automatic crossings. It is important to distinguish between

AUTOMATIC OPEN CROSSING – PROPOSED LAYOUT FOR CROSSING WITH HIGHER LEVELS OF PEDESTRIAN, RAIL AND ROAD TRAFFIC

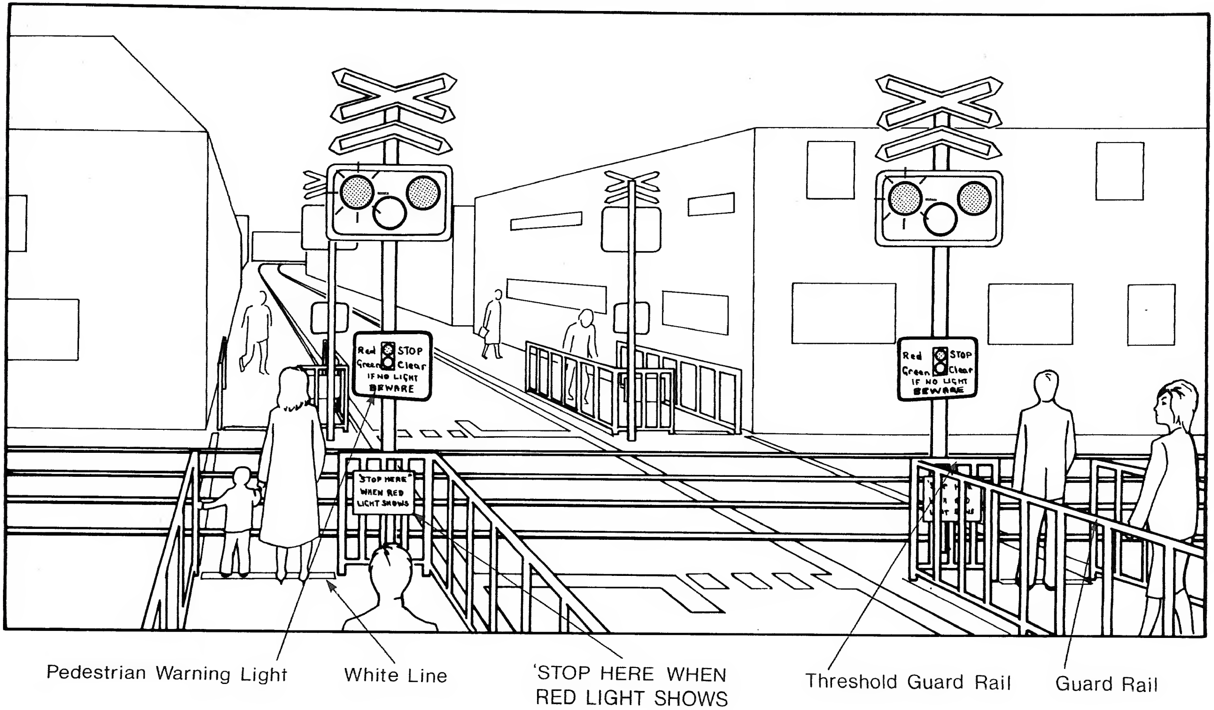


FIG. 4

the purpose of wicket gates at gated crossings and the present use of the wicket gate at those automatic half barrier crossings where such gates have been installed.

5.29 At gated crossings, unlocked wicket gates allow pedestrians free movement over crossings when the main gates are closed to road traffic. (Similarly, lockable wicket gates are often locked a short time after the main gates are closed to road traffic to minimise the delay to pedestrians).

5.30 Wicket gates at automatic crossings, where provided, have a different role. The brisk operation of the crossing closure cycle means that they cannot be used by pedestrians to reduce delay. There is not time to cross safely between the beginning of the warnings and the arrival of the train. Wicket gates at automatic crossings accordingly have a role opposite from that at gated crossings. They are used to dissuade pedestrians from crossing on the "open" side when the traffic lights are at red. The barring effect of the gates is increased by designing them so that they have to be pulled towards the user. Yet as wicket gates are not lockable they cannot be proof against the misjudgements of pedestrians. Moreover, as is evident from the TRRL/ Nottingham surveys an important side-effect of the wicket gate is to divert pedestrians on to the road. For those with prams and in wheelchairs the wicket gates are a severe obstacle.

5.31 We have considered whether the wicket gates might be constructed of lighter material and designed to be free-swinging so as to offer less of an obstacle to pedestrians. However, that would be defeating the purpose of the wicket gate at automatic crossings. We *conclude* that pedestrians at automatic crossings are probably more at risk from the presence than from the absence of wicket gates and *therefore recommend* that their use be discontinued. However, in reaching that view we *recommend* that clear audible and visual warnings be provided at the thresholds of crossings.

Warning signals and signs

Visual

5.32 At level crossings where pedestrian behaviour is influenced solely by visual and audible warnings, these must be forceful and unambiguous. At automatic open crossings and on the "open" side of the automatic half barrier crossing we *recommend* a standard warning sign with the words "STOP HERE WHEN RED LIGHTS SHOW". This sign would be mounted at the threshold of the crossing which would be marked (as now) by a white line.

5.33 In addition, at automatic crossings with relatively heavy pedestrian flow, we *recommend* the provision of warning lights. These lights should be about 1 to 1½ metres (about 4 feet) above ground level and mounted on the traffic light post, but angled towards pedestrians. We suggest these be in the form of the present minature red and green warning lights.

5.34 We also *recommend* the wider deployment of the new "Another Train Coming" flashing traffic sign which is used at automatic open crossings. Previously, flashing neon signs saying "Another Train Coming" were used at automatic half barrier crossings. However, following the recommendations of the 1978 Working Party, this sign was abandoned in favour of a fixed sign saying "ANOTHER TRAIN COMING if lights show". The reasons for abandoning the neon sign were partly technical; it made such heavy demands on the power supply of the crossing equipment that a standby supply was not economical. The decision also recognised that motorists are stopped by half barriers from going forward after the first train has passed.

5.35 However, pedestrians on the "open" side of the road have no visual reminder that a second train may be coming. We therefore *recommend* that at automatic half barriers with relatively heavy pedestrian traffic, the new "Another Train Coming" flashing traffic sign should be installed on the open side.

5.36 We note that a fixed sign saying "Keep Crossing Clear" is fixed just below the main traffic lights. We understand it was introduced after 1978 as an alternative to yellow box markings which are apparently expensive to maintain. Although not strictly within our remit, we doubt the value of this sign and would be surprised if motorists or pedestrians understand its relevance. If there is a real prospect of vehicles "blocking back" then yellow box markings are employed anyway.

Audible warnings

5.37 There is existing provision for audible warnings to be provided at automatic crossings. We *strongly endorse* the design of the present "warbler" warning sound for automatic open crossings. If a second train is coming at automatic open crossings, the audible warning sound increases in intensity and apparent urgency. The audible warning sound also continues at such crossings until road traffic is free to proceed. However, at automatic half barrier crossings the audible warning stops when the barriers have descended. We *recommend* that the approach which applies at automatic open crossings should be extended to automatic half barrier crossings. This arrangement would reinforce the "Another Train Coming" flashing signal.

The hierarchy

5.38 The effect of our recommendations will be to create a hierarchy of increasing pedestrian provision as the different types of traffic increase.

5.39 Arguably, the interpretation of the principles which we recommend should be left to local discretion. But we consider it important for a consistent approach to be adopted for all modernisation schemes. With that end in view, we set out at Annex D our judgment of the various traffic levels at which the different provisions should apply. We do not rule out the possibility of their adaptation and adjustment as experience is gained of their effect on pedestrian attitudes and behaviour.

Special considerations

5.40 In addition to these criteria, we consider that there will be other special factors which should be considered before decisions are taken about the type of modernisation scheme and about the level of physical separation provided between pedestrians and trains.

5.41 We have in mind circumstances where there may be concentrations of the most vulnerable groups of pedestrians immediately adjacent to a level crossing, including primary schools and homes or hospitals for the mentally or physically handicapped. In such exceptional circumstances, we *recommend* that a higher grade of pedestrian provision should be provided than might otherwise be appropriate.

5.42 The implementation of these criteria will be inevitably a matter for careful judgement. For example, if there are very few trains at such crossings or if the trains operate at times during the day which coincide with the heaviest concentration of pedestrian traffic, then other solutions (for example a crossing patrol) should be considered first.

Other factors

5.43 The criteria which we have proposed at the top of our hierarchy cover traffic conditions which go beyond the limits of the national experience of pedestrian behaviour at level crossings. As we have said there are many existing BR crossings with few pedestrians and much rail traffic and some crossings with many pedestrians and few trains. But there is very little experience of heavy pedestrian and heavy train flow together and in these circumstances we believe a cautious approach to be necessary.

5.44 At the same time we recognise that there are a few level crossings on relatively unconventional rail systems in urban areas with heavy train flow and a high level of pedestrian traffic. These railways can differ from the BR system in the positioning of level crossings relative to station platforms, in their operational procedures and in the type of rolling stock used. These differences, which are evident for example on the Tyne and Wear Metro, are so marked that we doubt that the experience of these unconventional railways can be directly translated to the conventional BR system at least so far as pedestrian behaviour is concerned.

5.45 We nonetheless believe that the principles we have set out should apply to less conventional railway systems, whilst accepting that the numerical criteria we have recommended will be of less relevance.

CHAPTER 6

CONSULTATION

6.1 We next discuss the adequacy of the present procedures for consulting local interests about level crossing modernisation proposals and for explaining how automatic crossings should be used and we make proposals for improvement.

Early attitudes

6.2 The way people feel about automatic crossings is very often formed well before a new crossing is proposed. Our survey has shown that level crossings which do not offer full physical protection are viewed with apprehension. These anxieties are no doubt increased by some misunderstandings about how automatic crossings work and some disbelief that they can be used safely, especially by children and the elderly. To some extent, attitudes seem to form and harden before all the facts are known.

6.3 The first discussion between local interests and British Railways Board about a particular modernisation proposal is a site meeting attended by BR, the Railway Inspectorate of the DTp, the highway authority and the district authority. This meeting is technical in character. It concerns road layout, road profile details, etc. Such technical discussions are without prejudice to any subsequent representations which the local authorities might make to the Secretary of State as is their statutory right.

6.4 The Railway Inspectorate of the Department of Transport have told us in written evidence about "schemes which are perfectly acceptable from the technical angle, and agreed as such at the site meeting, suddenly becoming the subject of emotional debate and outcry".

Need for early consultation

6.5 These expressions of local public concern must in our view be faced positively and constructively from the very outset. First, we *recommend* that BR inform the relevant local authorities at both County and District level of a particular modernisation proposal through the Chief Executive. This early approach to the local authority, which should be before the first site meeting, should cover:—

(i) the context of a particular modernisation proposal;

(ii) the different types of modern level crossing;

(iii) BR's reasons for proposing the particular type of crossing for the site in question.

6.6 We also *recommend* that the initial site meeting be preceded by a more general public meeting at which all the local interests concerned would have an opportunity to put their view-points and which would enable BR to present their proposals. Such a meeting should be chaired by a local person of recognised impartiality. The aim of the meeting could not be to reach decisions on a particular proposal; that is a matter for the Secretary of State on the advice of the Railway Inspectorate. The new forum which we recommend would give all parties an opportunity which currently does not exist, to form a better understanding of the viewpoints of others.

New promotion material

6.7 We recommend the development of new promotion material. It was evident from our public meetings that many people had not seen or used automatic crossings either as pedestrians or motorists. In the absence of factual visual material, people will be concerned and fearful. We believe it important for BR and the Department of Transport to develop a visual presentation package for use at the early informative stages. BR have in fact embarked on the production of such visual aids and we have seen early versions. We strongly endorse the idea but believe the content and presentation should be much more closely tuned to people's evident anxieties. In particular we *recommend* that the visual material should include:—

(i) examples of people using the crossings unrehearsed, including children and the elderly in urban, rural, day-time, night-time and other circumstances;

(ii) examples of what people commonly say about automatic crossings when they have lived with them for a substantial time.

6.8 It would also be helpful to include some examples of the benefits of modernisation including the possibility of improved road layout and reduced delay. And if our proposals for improved pedestrian provision are implemented, then these provisions should be emphasised. Sensitive and factual visual aid material will be an essential requirement over the next few years.

6.9 It might be argued that the presentation of such material will raise doubts about the safety of automatic crossings which might otherwise not have arisen. We would reject that argument. It is evident that the prospect of automation creates anxieties and that people feel more apprehensive as the level of physical separation from trains decreases. This is particularly true of the automatic open crossing which will be the main instrument of BR's modernisation programme over the next decade.

6.10 We envisage a showing of this visual aid material being offered to local authorities at the early stages of consultations and perhaps forming part of the public discussion we recommend in paragraph 6.6. If the local authorities thought it helpful, the material could be shown to people living in the vicinity of the site proposed for modernisation.

Tighter timescale for consultations

6.11 A third necessary area of change concerns the duration of consultations. From case studies prepared for us by the Department of Transport and BR it is evident that the period which can elapse between the first expressions of local apprehension and the eventual implementation of an automation proposal can be at least 2 years and in some cases much longer. During this lengthy period it is inevitable that local feelings should grow. Continued uncertainty breeds misunderstandings.

6.12 We *recommend* that a firm programme should be prescribed for each scheme and adhered to. We see no reason why the form of a modernised crossing should not be resolved within 12 months of the first site meeting.

PUBLICITY

6.13 From the earliest days of level crossing modernisation there has been periodic consideration of the arguments for and against a national publicity campaign. The consistent conclusion has been that the scale of the modernisation programme and the number of road users directly affected did not justify a national campaign. We agree. The number of pedestrians using level crossings regularly is probably about 250,000 nationally. Almost all pedestrian users of level crossings will be local people in the sense that they work or live near crossings. Attempts to fine-tune a national campaign to an audience of this size and character would be unjustified.

6.14 The public relations arm of BR has traditionally directed most of its involvement in level crossing conversions to the publication and dissemination of factual material.

6.15 The Board's present arrangements for disseminating information to local road users start about 3–4 weeks before work begins on a site conversion. The material includes a statement to the media coupled with the widespread local distribution of leaflets and of posters. The "target" recipients of the publicity material include schools, garages, post offices, libraries, the police, community bodies and transport undertakings.

6.16 The Board contacts heads of schools near to the level crossing well before work begins and their cooperation is sought for BR staff to give talks to pupils. We have discussed the attitude of local teachers to such requests with one of the Board's regional public affairs representatives. We were informed that this was always forthcoming. We also understand that in one region at least, a working model of an automatic crossing is sometimes used in presentations at primary schools. We *strongly support* the wider use of such visual aids.

6.17 We find ourselves broadly content with the local BR machinery for distributing the relevant information once a modernisation proposal has been agreed. However, we believe two items in the BR information material could be further improved:—

(i) the leaflet which explains how automatic crossings work;

(ii) the educational and instructional film.

The BR leaflet

6.18 There is an obvious problem inherent in devising an information/education leaflet which is relevant to a wide range of users and yet to present it in a form which is readily understood. We believe the content of the leaflet to be broadly right. However, in our view the most important features should be emphasised more. Clear knowledge of the facts that automatic crossings are activated by the train, that the train may be at the crossing in less than 30 seconds after the traffic lights start to flash and that the train cannot stop are essential to the safe use of the crossing. Stress should be put on these facts.

The BR film

6.19 Hitherto the main BR visual aid for instructing road users and particularly children about automatic crossings has been the film "Toeing the White Line". The content of the film is now out-of-date and the Board are therefore arranging for the production of a new film at present entitled "Old Sam". The Board were good enough to show us this, although it is not yet completed. We made clear to the Board at an early stage of our deliberations that we were not impressed by this material. In our view the message and the target audience need to be more clearly defined.

CHAPTER 7

FINANCIAL AND ORGANISATIONAL ASPECTS

7.1 Our remit does not require us to consider the financial or organisational aspects of level crossing modernisation proposals. However, insofar as our recommendations impinge on these wider aspects, we feel it appropriate to comment briefly.

Financial aspects

7.2 The criteria we recommend apply primarily to future modernisation schemes. A retro-active programme would be called for if there was evidence of pedestrians being at risk at existing modernised crossings. We have received no such evidence. Our proposals are aimed at further reducing the chance of an accident.

7.3 This is not to suggest that existing modernised crossings should not or cannot be brought progressively within the scope of our criteria. We have noted that the equipment at some modernised crossings will be due for replacement shortly. We would expect our criteria to be applied in this replacement programme. Over time therefore, the level and type of pedestrian provision at all modernised level crossings should be uniform. But we acknowledge that BR's first call on finances will be for the replacement of gated crossings by more modern protection systems. We note that 50% of the costs of operating, maintaining and modernising BR's level crossings is met by the Government in the form of a specific grant payable under EEC rules.

7.4 The criteria we recommend will add to the costs of modernising level crossings. To that extent they will affect the investment return from converting an existing crossing to a more modern protection system.

7.5 The added costs from our recommendations are:—

(i) *equipment;* more extensive use of pedestrian guard rails, new pedestrian warning lights;

(ii) *labour;* the extra costs in trenching, cable laying arising from the new equipment;

(iii) *land;* the extra space required to give pedestrians a clear route to and through the crossing.

7.6 So far as equipment and labour are concerned, these items together could add about 5% and 10% respectively to the average costs of converting a gated crossing to an automatic half barrier or to an automatic open crossing. On average therefore, these added costs will have only a very marginal effect on the pay-back of the investment.

7.7 So far as land is concerned, the additional costs involved would depend on whether or not this was already owned by BR and what use was being made of it.

Cost sharing

7.8 The marginal cost of providing a better layout for pedestrians might be therefore a relatively small proportion of the cost of the conversion. But it could be a high cost and change an attractive investment project into a less attractive scheme. However, BR's overall investment appraisal of a particular project can depend on the contribution from local authorities. We understand that the respective contributions by a Highway Authority and BR for a particular modernisation scheme which involve road works are assessed on a project-by-project basis. It would seem therefore that there is an accepted idea of cost-sharing. This approach is equitable. Since Highway Authorities are responsible for *road* safety, it is only proper that they should bear some part of the costs of clear pedestrian approach routes to a level crossing. Indeed this should apply to provisions for pedestrian safety on the crossing itself since crossings are public roads for almost all of the time.

7.9 There are in any case benefits to be weighed in the balance. These costs will be far outweighed by the savings to BR and the Government from automation. It is evident that local opposition to a modernisation scheme can hold up automation for some years. Improved pedestrian provisions should enable some schemes to be implemented earlier than they would be otherwise and thereby generate earlier savings.

Organisational aspects

Consistency

7.10 We have observed that there can be technical circumstances in which a manually controlled barrier crossing can be installed because the signalling and circuitry for an automatic crossing would be extremely complex eg at a junction. We have also observed that such installations can cause local public resentment if the volume of road and pedestrian traffic is lower than that at a nearby automatic crossing.

7.11 We also note that there can be differences between BR Regions in the interpretation of the Construction and Operation requirements through changes in personnel and differences in approach. These variations are understandable although undesirable.

7.12 However, in the past BR has exercised some central technical direction and uniformity of approach through a specialist level crossing section placed in the Directorate of Signals and Telecommunications (ST) of BR.

7.13 We have been told that this specialist section has recently been abolished as part of wider organisational changes in BR. There is no focal point within BR to ensure that a broadly consistent approach is adopted for the next phases of BR's level crossing modernisation programme.

7.14 One consequence is that the Railways Inspectorate of the Department of Transport is to some extent increasingly providing the technical and co-ordinating support which has hitherto come from within the ST Directorate of BR.

7.15 This seems to us to place the Department of Transport Railways Inspectorate in an undesirable position which may be incompatible with its independence and may inhibit the Inspectorate in its role in advising the Secretary of State on particular proposals.

7.16 In oral evidence, the Chief Inspecting Officer expressed concern about this potential conflict. We support his view that BR should themselves appoint an experienced central co-ordinating officer even if the specialist level crossing section is not re-formed.

CHAPTER 8

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

8.1 Our remit required us to carry out a general review of pedestrian safety at level crossings, to consider whether changes were justified and to make recommendations. Our task was not to reach a view or decision about any particular modernisation proposal.

8.2 At most sites where automatic crossings have been installed, they have apparently been accepted without objections. At some sites, feelings are mixed but uneasiness remains. At some other places, the proposed introduction of automatic crossings has led to strong opposition. Expressed fears for children are paramount. We understand those anxieties.

8.3 No child pedestrian has been hurt on an automatic crossing. There have been very few pedestrian casualties at all types of level crossing.

8.4 In BR's modernisation programme, automatic crossings could be proposed for sites which have different pedestrian, and rail traffic conditions from those for which there is experience to date. Furthermore, the present criteria which guide BR on the types of level crossing which are suitable for different road and rail conditions take no direct account of pedestrians. We believe they should.

8.5 Whilst therefore we appreciate and uphold BR's desire for progress, increased efficiency and cost savings, we consider that the Board's level crossing modernisation programme should not continue without additional guidelines and criteria which reconcile the interests and natural fears of pedestrians.

8.6 Our approach to pedestrian safety is that pedestrians at level crossings should be provided with more space, clearer separation and increased physical protection from rail and road traffic as traffic levels increase.

Conclusions

8.7 On the basis of the available evidence, including accident statistics, automatic crossings appear to be no less safe for pedestrians than the gated crossings they replace. There are qualifications; the average automatic crossing is not used intensively by people on foot. If that factor was to change and if automatic crossings were to be installed increasingly in towns and used by many pedestrians, then past experience might not be so relevant to the new conditions. Nevertheless, our surveys indicate that pedestrian observance of the warnings at automatic level crossings is very good.

8.8 Gated or barrier crossings and automatic crossings offer different kinds of protection. We have considered the feasibility of combining the characteristics of both in an automatic full barrier system. We conclude that such a system would be impractical and ineffective.

8.9 The anxieties of pedestrians about modernised crossings increase as the level of physical separation from trains decreases. Because of this, a much more determined effort will need to be made by BR to involve local people at the formative stages of a modernisation proposal.

8.10 The present guidelines setting out the requirements and standards to be met for different types of level crossing should include new additional pedestrian criteria and in some cases extra safeguards.

8.11 Since highway authorities are responsible for *road* safety it is equitable that they should bear some part of the costs of improved pedestrian pathways leading to level crossings.

8.12 A retro-active programme of improved pedestrian provision at already modernised crossings would not be justified. These crossings should be brought progressively within the scope of the proposed new criteria as their equipment comes up for replacement.

Recommendations

8.13 We recommend as follows:

(paragraph reference)

ACCIDENT STATISTICS

(i) *Accident records*—the Railways Inspectorate should review the present reporting arrangement for level crossing accidents. 3.30

ROAD SIGNS

(ii) *Advance road signs*—uniformity should be achieved between the advance road sign for automatic open crossings and that for other types of level crossings, if necessary within an international code. 5.21

(iii) *Distinctive general warning signs*—should continue to be employed; they emphasise the presence of automatic crossings both for pedestrians and motorists. 5.22

WARNING SIGNALS AND SIGNS

Visual

(iv) A fixed metal warning sign should be mounted at the threshold of automatic crossings (STOP HERE WHEN RED LIGHTS SHOW) 5.32

(v) At automatic crossings with heavy pedestrian flows, warning lights should be mounted on traffic light posts about 1–1½ metres (about 4 feet) above ground level. The lights should take the form of miniature red and green warning lights. 5.33

(vi) The 'Another Train Coming' flashing traffic signal should be installed on the open side of automatic half barrier crossings where pedestrian traffic is heavy. 5.35

Audible

(vii) Audible warnings at automatic half barriers should continue to sound until road traffic is free to proceed. 5.37

SPACE AND PHYSICAL SEPARATION

(viii) A hierarchy of pedestrian provision should be adopted, providing increasing space and separation as traffic levels increase. At the quietest crossings, there should be sufficient space marked on the crossing itself for pedestrians and road vehicles to be separated. 5.23 5.24

(ix) When road and pedestrian traffic is heavy, guard rails should be installed between the footway and the carriageway. The width of the footways and route on the crossing itself should be wide enough for pedestrians from both directions to pass comfortably. 5.25

(x) Where rail and pedestrian traffic is heavy, guard rails should run partially across the threshold to create a safe waiting area. Wicket gates should not be employed; their presence probably puts pedestrians more at risk than if they were absent. 5.26 5.30

(xi) At crossings with the heaviest train and pedestrian traffic, manually controlled barriers would be justified. 5.31

SPECIAL FACTORS

(xii) A higher grade of pedestrian provision should be provided than might otherwise be appropriate at crossings where vulnerable groups of pedestrians are concentrated (as in primary schools and homes or hospitals for the physically or mentally handicapped) immediately adjacent to a crossing. 5.41

CONSULTATION

		(paragraph) (reference)
(xiii)	BR should inform local authorities of modernisation proposals through Chief Executives, before the first site meeting.	6.5
(xiv)	A new forum should be provided for all interests to express their views and concerns and for BR to present their proposals.	6.6
(xv)	The content and presentation of BR's visual aid material should be much more closely tuned to people's evident anxieties.	6.7
(xvi)	There should be a firm programme for consultations and decisions.	6.12

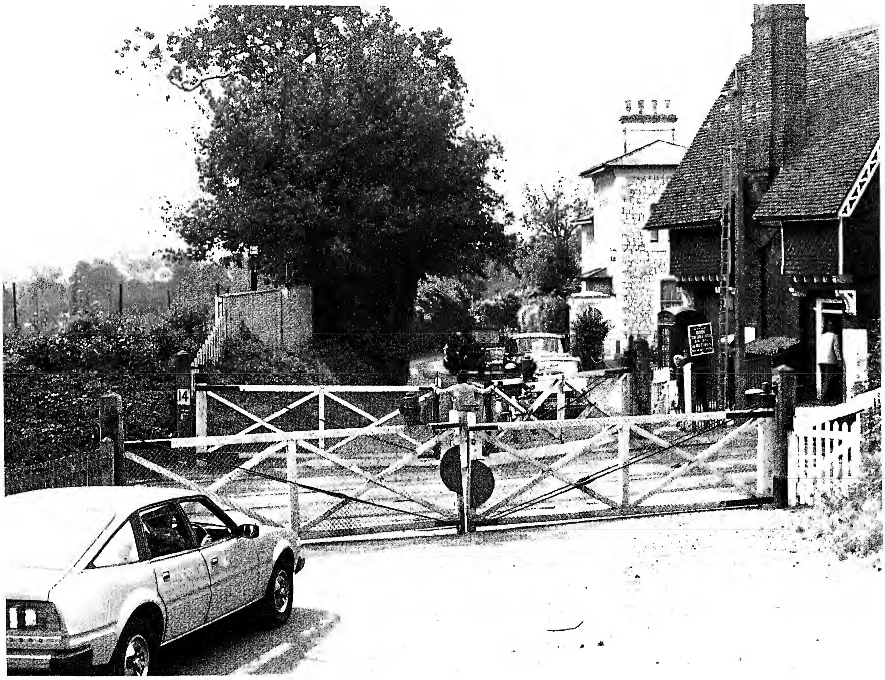
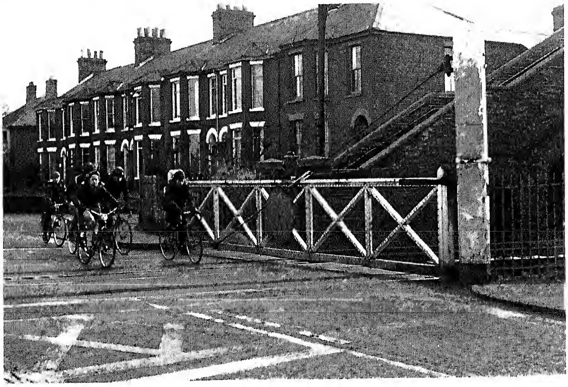


Fig 5 Gated Crossing (with wicket gates)

Fig 5A Gated Crossing (urban setting)



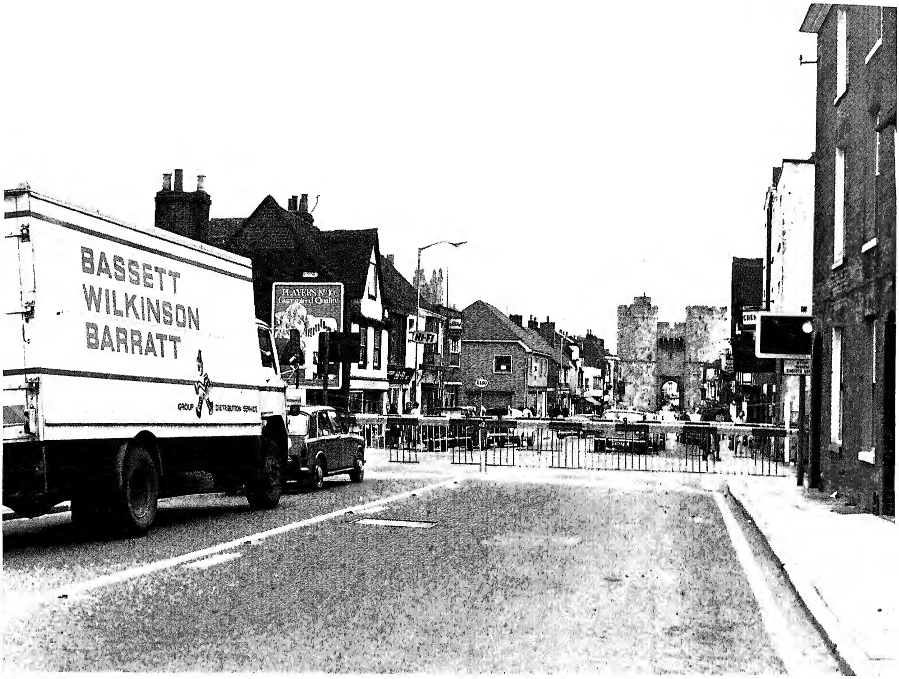
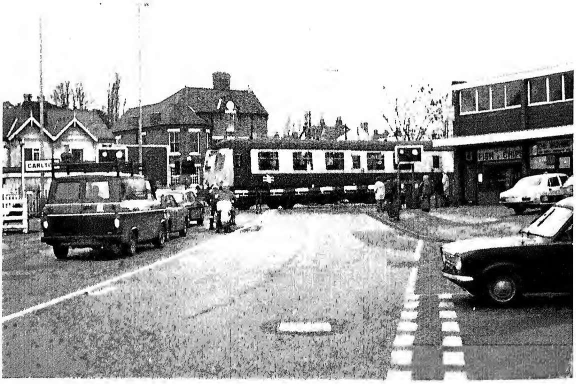


Fig 6 Manually Controlled Barriers (operated from adjacent signal box)

Fig 6A Manually Controlled Barriers (operated remotely by closed circuit television)



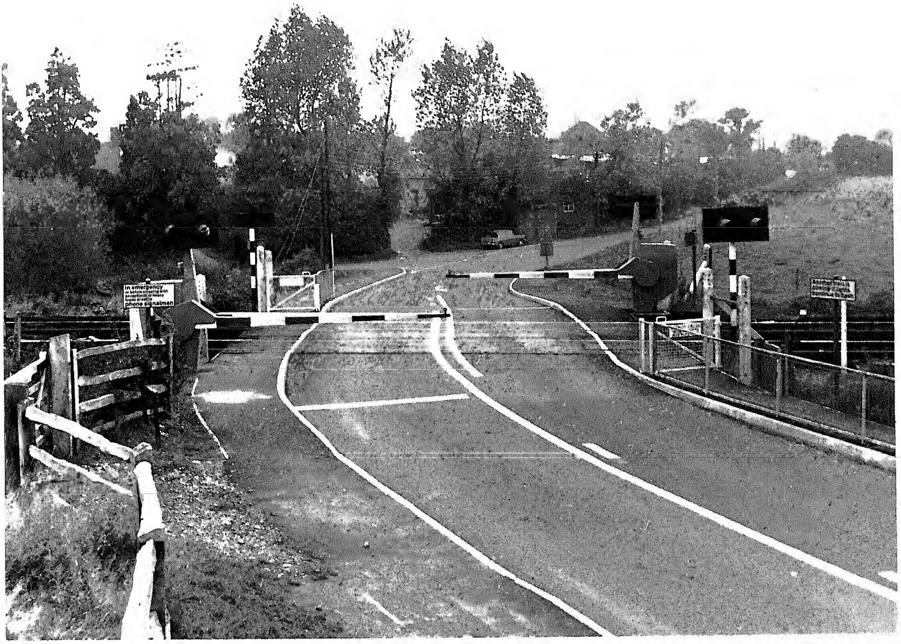
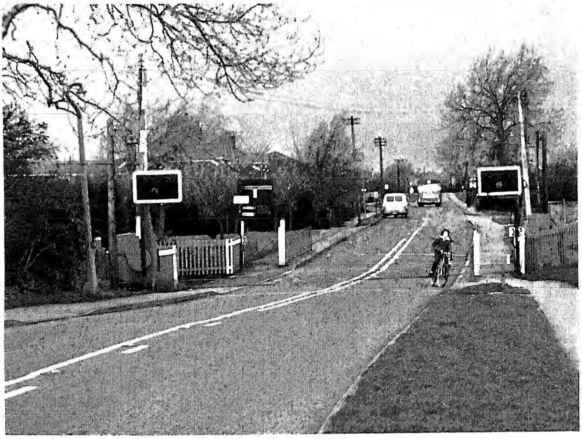


Fig 7 Automatic Half Barrier Crossing (old style with no amber light) with wicket gates

Fig 7A Automatic Half Barrier Crossing in urban setting with now discontinued "another train coming" flashing sign.



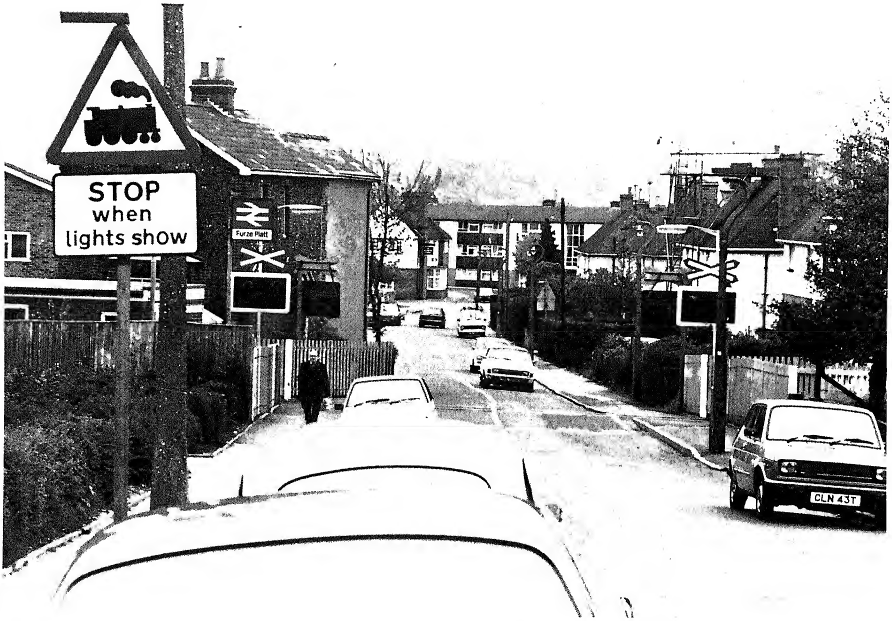
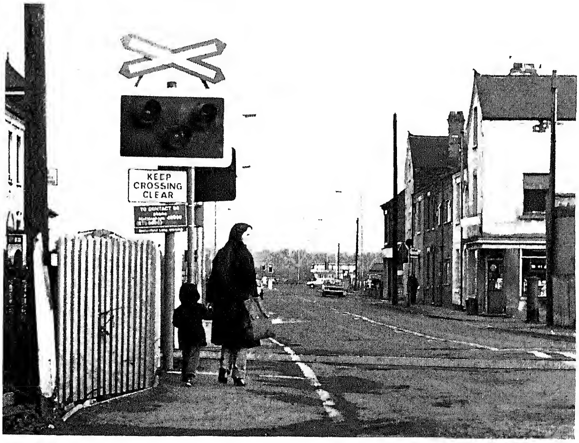


Fig 8 Automatic Open Crossing (single line) near a station—the approach

Fig 8A Automatic Open Crossing (single line)—pedestrian view from "nearside" approach



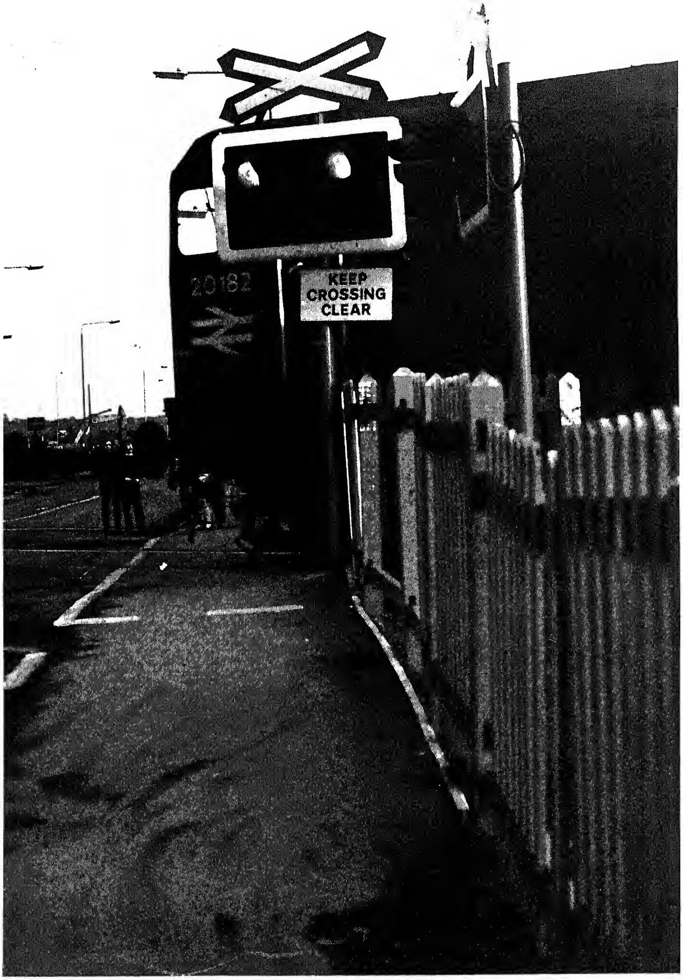


Fig 8B Automatic Open Crossing (single line). Pedestrian view from "offside" approach

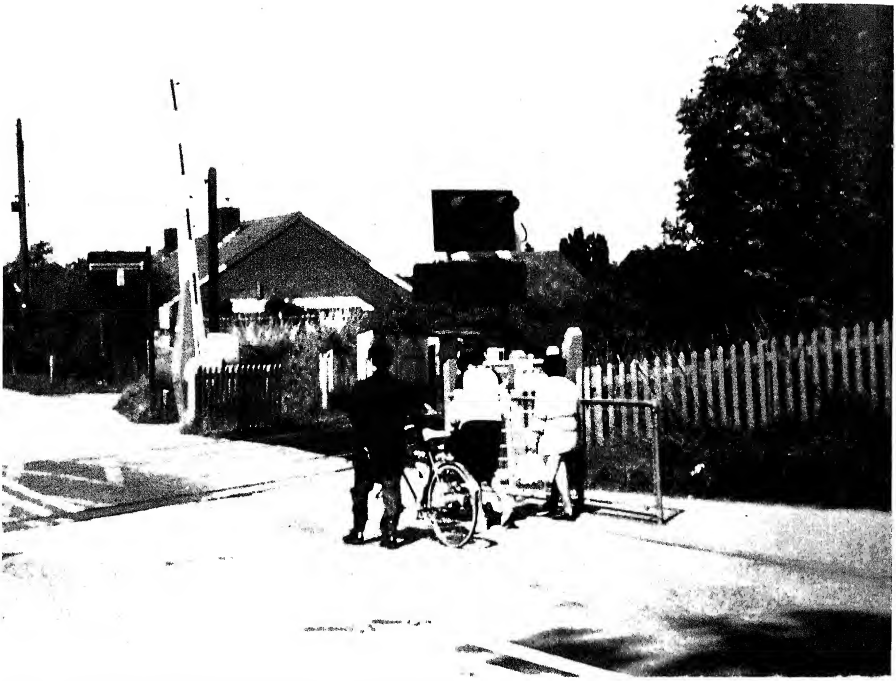


Fig 9 Automatic Half Barrier Crossing—an effect of the wicket gate

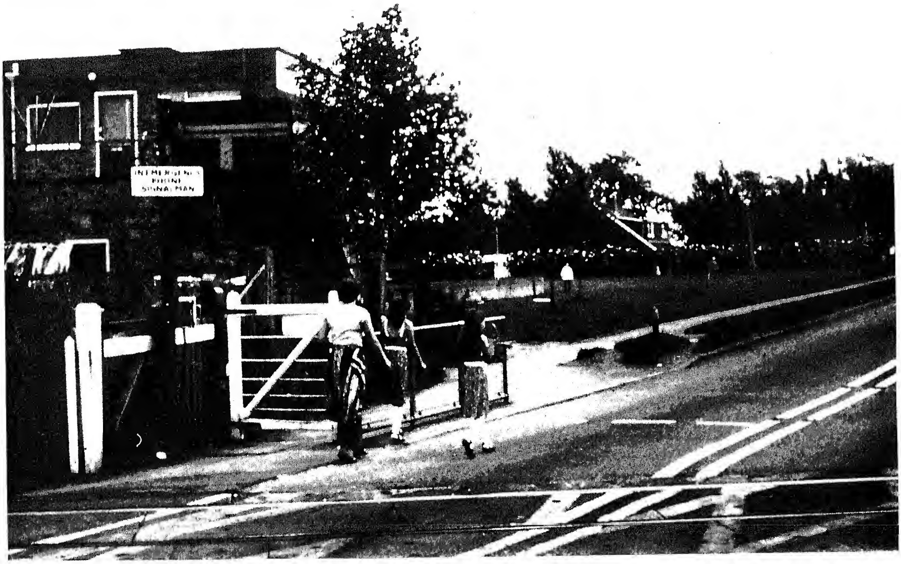


Fig 9A Automatic Half Barrier Crossing—an effect of the wicket gate

ANNEX A

THOSE WHO SUBMITTED WRITTEN EVIDENCE

Age Concern
Associated Society of Locomotive Engineers and Firemen
Association of Chief Police Officers of England, Wales and Northern Ireland
Association of Chief Police Officers—Scotland
Association of County Councils
Association of District Councils
Association of Minor Railway Companies
Association of Scottish Police Superintendents
Automobile Association

British Railways Board

Calladine C. R.
Cambridgeshire County Council
City of Cambridge
Cockburn T. D.
Convention of Scottish Local Authorities
Council for the Principality

Davey Mrs E.
Department of Transport

Friend A.

Greater London Federation of Parent-Teacher Associations

Harper G.
Health Education Council
Husselbury J.

Longstone Community Council

Merseyside County Council
Metropolitan Borough of Wirral Education Department
Morris Mrs J.

National Confederation of Parent-Teacher Associations
National Federation of Post Office and British Telecom. Pensioners (Maidstone branch)
National Union of Railwaymen
National Union of Townswomens Guilds
Neale Richard W.

Pedestrians Association
Pensioners' Voice
Pre-School Playgroups Association

Railway Development Society
Railway News (Ian Allen Ltd)

Smith Mrs Ann

Tyne and Wear Transport

Welsh Association of Community and Town Councils
Welsh Counties Committee
Wirral Borough Council

ANNEX B

RELIABILITY OF EQUIPMENT

1 The following paragraphs describe the basis of BR's equipment design and are reproduced from the Joint DTp/BR 1978 Working Party on Level Crossing Protection:—

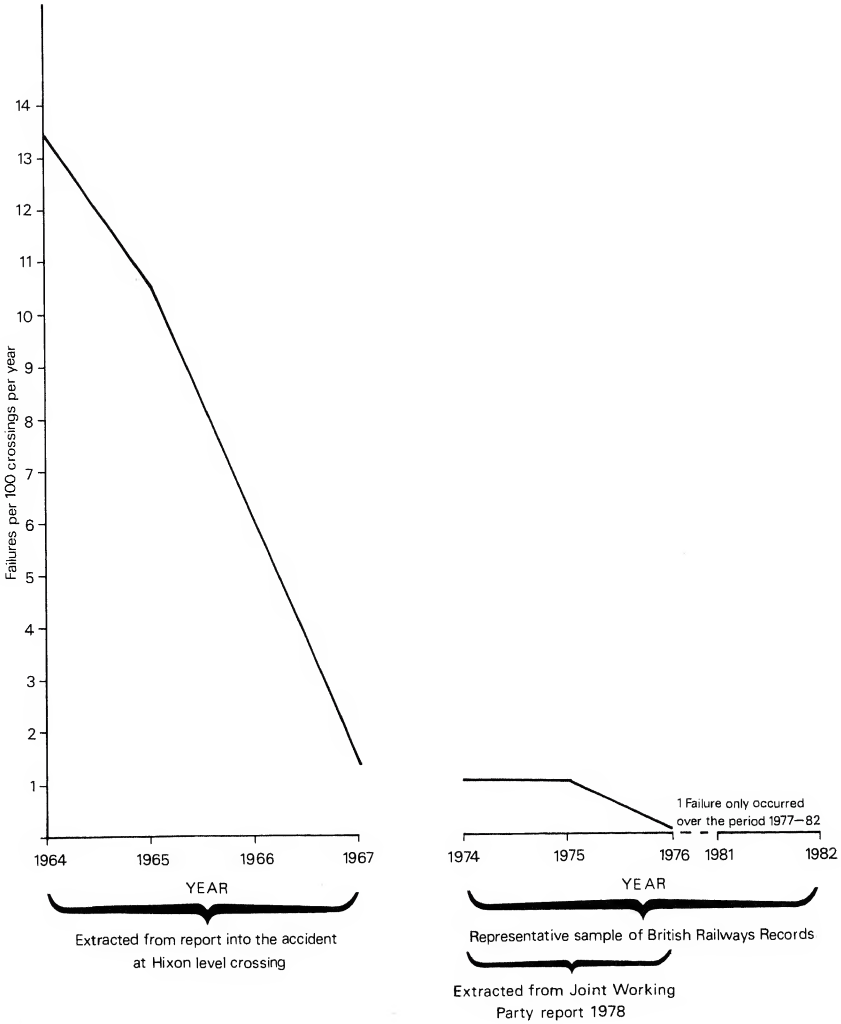
> **14.2.** BR design their signalling equipment on a "fail-safe" basis and classify equipment failures as "right-side" if they do not result in a reduction of the protection normally provided. For example, a right-side failure in an AHB system could allow the system to operate and close the crossing to the road even though no train was coming. This could cause considerable delay and inconvenience to road users, but is safe.
>
> **14.3.** Failures which do result in a reduction of the protection are classified as "wrong-side", and these are further classified as "unprotected" or "protected". If a train was able to approach an automatic crossing without any warning being given at all this would constitute a "wrong-side unprotected" failure. If follows that "wrong-side unprotected" failures are very serious failures indeed. On the other hand a "wrong-side protected" failure would not be so serious since the signalman could warn train drivers.
>
> **14.4.** Annex (B1) gives the details of unprotected wrong-side failure rates of AHB for two periods. The details for the period 1964–67 are taken from the Hixon Report (paragraph 254) whilst the figures for 1974–76 are taken from a representative sample of 40% of AHB on BR. The graphs show a steady improvement.
>
> **14.5.** We studied the causes of these failures—which may not be detected by the monitoring system. These could result in a train approaching a crossing unprotected. There have also been one or two cases where installation and maintenance staff have caused wrong-side failures.
>
> **14.6.** We also studied the causes of protected wrong-side failures which included cases where electrical storms have put both main and battery supplies out of action and the failure of a battery charger which went undetected until a failure of the mains power supply occurred. In every case of this type of failure, where the barriers would be in the lowered position without road traffic lights, the signalman or crossing keeper has been alerted by the monitoring system and able to put into effect the various protection procedures including stopping and warning trains of the failure, the provision of a temporary crossing keeper and the calling out of technicians to deal with the fault.
>
> **14.7.** BR very carefully investigate each case of wrong-side failure, identify the cause and, if it is a matter of equipment, take necessary action to ensure that so far as possible there can be no repetition. In this context it is appropriate to mention that we were told that failures of the system are quite commonly alleged by members of the public who may imperfectly understand its working or are simply mistaken; each allegation is, however, thoroughly investigated.
>
> **14.8.** There have been no accidents caused by failure of the system equipment and we are satisfied that the nature and reliability of the equipment currently used is of a very high standard. We see no reason to recommend any changes.

(Extract from Chapter 4, 1978 Report on Level Crossing Protection)

2 We asked BR to up-date Annex B1. BR inform us that since 1976, there has been one wrong-side failure at the sample of AHB sites referred to in paragraphs 14.4 above. We understand that there have been no accidents at automatic level crossings caused by equipment failure.

ANNEX B1

WRONG-SIDE UNPROTECTED FAILURE RATES OF AUTOMATIC HALF-BARRIERS



ANNEX C

PEDESTRIAN ACCIDENT STATISTICS—NETHERLANDS AND FRANCE

Introduction

1 We thought it would be helpful to our considerations to form a general assessment of the pedestrian accident record at level crossings in some other European countries with similar protection systems to those employed here. We obtained helpful information from the Netherland Railways (NS) and are grateful to Ir. D C Hasselman of NS for providing the data through British Railways. We obtained accident data from the French National Railway Company (SNCF) direct and combined this with a one-day meeting with SNCF officials to discuss in particular the accident record for their automatic full barrier system (SAL-4). We are very grateful to M. Mallet and M. Brevart for giving us their time so generously.

2 We note here the conventional qualifications about international comparisons of statistics and procedures. Differences in data classification, in the technical characteristics of the different types of crossing and in legal provisions mean that comparisons between one country and another can never be conclusive. With those qualifications in mind, we set out below the accident figures for pedestrians.

TABLE 1: **Netherlands**

3. *Type of crossing*	*Average no of crossings(¹)*	*Average no(¹) killed(²) (per annum)*	*Pedestrian fatality rate(²) (per 100 crossings) (per annum)*
Manned Barriers	164	0	0
Automatic Half Barriers	632	4	0·6
Automatic Open Crossings	835	1	0·1

Notes:
Source: BR/Dutch Railways
Note (¹) The period to which the statistics relate is 1977–81—a 5 year period.
(²) The figures exclude pedestrians who were injured. Apparently 4 pedestrians were injured over the 5 year period at all crossings.

TABLE 2: **France**

4. *Type of crossing*	*Average no of crossings*	*Annual average no of Casualties(¹)*	*Pedestrian casualty rate (per 100 crossings)*
Manned Barriers with 'wickets'	5332	21	0·39
Automatic Full Barriers (SAL-4)	551	3·1	0·56
Automatic Half Barriers (SAL-2)	8639	11·3	0·13
Automatic Open Crossing (SAL-0)	352	0·1	0·03

Source: SNCF
Note (¹) Casualties includes fatalities and injuries

Commentary

5 *The Netherlands.* The first noteworthy feature of Table 1 is the very large number of automatic crossings; manned barriers are a small minority reflecting the virtual completion of an automation policy. Second, the very low pedestrian fatality rate at automatic open crossings appears to be in line with experience in this country. As in the UK, manned barriers have an excellent pedestrian casualty record.

6 We understand that pedestrians are provided with special warnings (audible and visual) on the 'open' side of an automatic half barrier crossing when pedestrian traffic is heavy.

7 *France.* Table 2 shows that the pedestrian casualty rate at automatic level crossings increases with the extent of the physical separation provided between road users and trains. The SNCF suggested in discussion that if the accident rates for each type of crossing were weighted to reflect differences in pedestrian flows, then the differences might not be as marked.

8 Nonetheless, the SNCF believe that in principle, the automatic full barrier system (SAL-4) is inherently more dangerous than automatic half barriers (SAL-2) because of the risks of road users becoming trapped. The SNCF also informed us that is is policy to phase out progressively their type of automatic open crossing (SAL-0). Apparently there was a serious accident between a train and a road vehicle at such a crossing some years ago. The main instrument of SNCF modernisation policy is the automatic half barrier which, as Table 2 shows, has a low pedestrian casualty rate. The SNCF informed us that the decrease in the number of road-user casualties at level crossings in France over the last 20 years or so is attributable to their automation programme and that replacement of manned barrier crossings (there are no gated crossings) is firm Government policy.

9 There are no specific provisions for pedestrians at automatic level crossings. The law requires pedestrians to obey the traffic lights and it is an offence not to do so. However, whilst there are no explicit pedestrian criteria in the relevant regulations, we understand that the presence of large numbers of pedestrians combined with frequent trains can lead to installation of a SAL-4 type (automatic full barrier) rather than a SAL-2 type.

ANNEX D

MATRIX OF PEDESTRIAN PROVISION

PEDESTRIANS	TRAINS			
	LOW	LIGHT	HEAVIER	HEAVIEST
LOW	Adequate space on crossing. → Sign "Stop here when red light shows".			
LIGHT	Adequate space on crossing plus clearly marked footways. → on both sides of crossing. Sign "Stop here when red light shows".		Pedestrian → Warning Lights.	
HEAVIER	Adequate space on crossing plus clearly → marked footways on both sides of crossing. Sign "Stop here when red light shows".		Pedestrian Warning Lights. Pedestrian → route* and 'precinct'.	
HEAVIEST	Adequate space on crossing. Clear footways on both sides → of crossing. Sign "Stop here when red light shows".	Pedestrian → Warning Lights.	Pedestrian route* and 'precinct'.	Manually Controlled Barrier.

ROAD VEHICLES

Where the road traffic is above 50 vehicles an hour, pedestrian guard rails should be provided where there are footways.

KEY—See below.

*'Pedestrian route & precinct, is a short-hand way of describing the provisions we recommend in paragraph 5.26 and illustrated at Fig 4.

Pedestrian criteria

FACTORS (relating to 18 hour day)

1. Pedestrian traffic (per day)

low — less than 300
light — 300 to 1000
heavier — 1000 to 2000
heaviest — more than 2000

2. Train traffic (per day)

low — up to 5
light — 5 to 20
heavier — 20 to 150
heaviest — more than 150

3. Road vehicles (average per hour)

light — less than 50
heavy — more than 50

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